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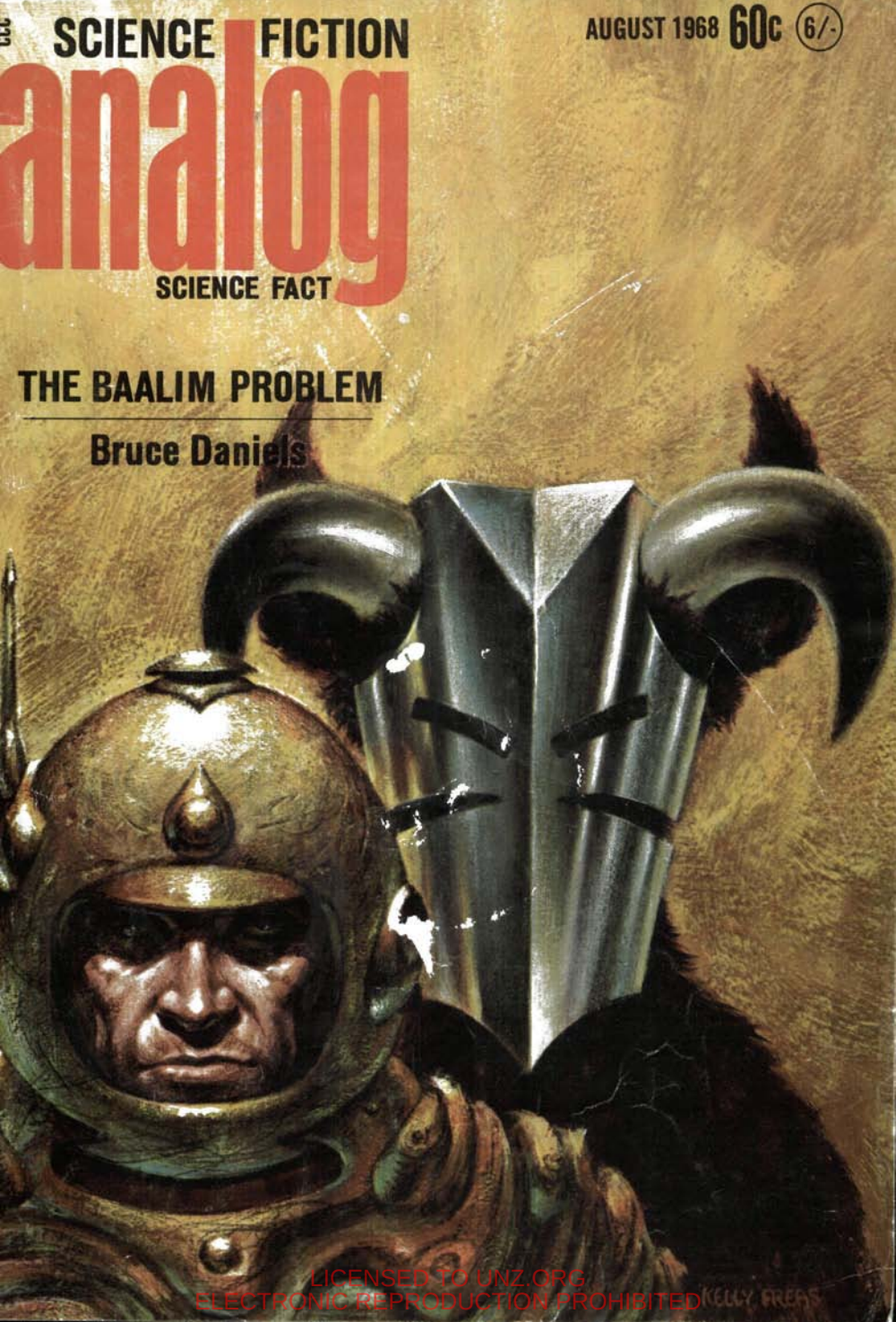
THE BAALIM PROBLEM

Bruce Daniels



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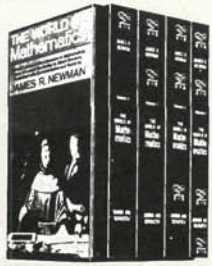

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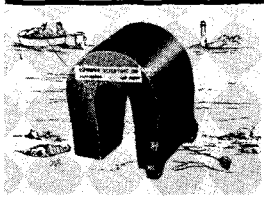

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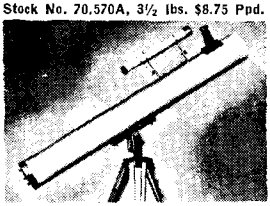

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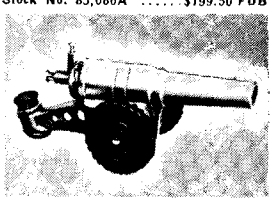

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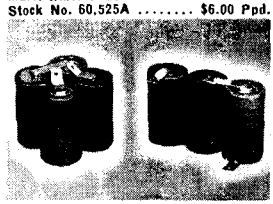

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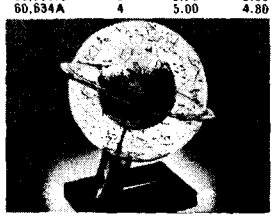

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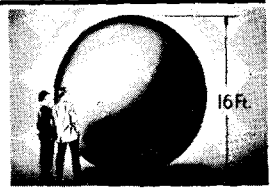

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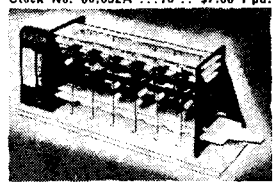

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IN MEMORIAM

an editorial by John W. Campbell

It's April 5, 1968 as I write this, and an as-yet-unknown crackpot has succeeded in doing the world a considerable disfavor, and unquestionably boosted his own futile ego vastly. He killed Martin Luther King.

The first thing to remember is that if a crackpot can, from hiding, kill a President—another can kill a King. Even with all the security efforts surrounding Kennedy, a crackpot did "achieve" his giggling ego-boost; there was, after the fact, a lot of furor about inadequate security measures—but actually the intensive and exhaustive study of the situation simply showed that no rational security measures could have prevented a lone crackpot from expressing his homicidal madness.

Incidentally, speaking of Presidents and Kings—the desire to take on that thankless job of President of the United States must require a very special kind of personality. As if Johnson, on April 4th, didn't have enough troubles—he'd just withdrawn from the nomination race, and was preparing for opening peace talks in Vietnam, if you recall—that murdering crackpot must have made his day really complete.

However, those considerations are minor things; the great lesson to be learned from this whole pattern of events—a lesson that needs really careful consideration and evaluation by both Negro and white alike—is that nothing could more clearly prove that Martin Luther King's nonviolent approach to the race problem was unarguably the effective way. Even the most violently bigoted racist monomaniacs of the type that shot him agreed on that.

That's why King, the nonviolent but persistent worker was the target—not those noisy, hate-filled, arrogant "black Power" loudmouths, H. Rap Brown and Stokely Carmichael.

It would *seem* obvious that the Ku Klux Klan type would naturally pick hate-mongers like Brown and Carmichael, rather than non-violent men like Medgar Evers and Martin Luther King.

Facts, however, quite clearly demonstrate that that "seeming" is an illusion; the Prophets of Violence, the arrogant boasters, are not targets for assassins. My strong

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hunch is that the best recruiting agents the Ku Klux Klan ever had are, in fact, H. Rap Brown and Stokely Carmichael. They are publicly demonstrating precisely the intolerable characteristics that the Ku Klux Klan type mentality assigns to Negroes—they *are* the stereotypes of the "nigger-hating" bigots. Arrogant—preaching murder and violence—inciting to riot—waving guns as an answer to all human troubles—

Precisely the Ku Klux Klan model of The Enemy. Magnificently effective in recruiting new members, and inspiring more citizens to buy guns for self-defense—or, of course, a forestalling attack.

The loudmouthed "Black Power" advocates have done more to increase Ku Klux Klan membership, and arouse fearful white belligerency than anything all the efforts of Grand Dragons and their ilk could achieve. As for changing white opinions to more recognition of the Negro as a fellow man—they do a magnificent job as mind-setting catalysts. Kind of like an epoxy glue; the resin is a viscous liquid, and will stay that way for a long time—until you add the catalyst; then it undergoes a cross-linking reaction that leaves it hard, tough, immutably set, and almost totally insoluble.

Nothing more pleases the Grand Dragon types than the actual effect of a noisy, arrogant, militant Black Power blowhard; it confirms the picture the Grand Dragons want to draw, firmly sets the minds of the citizenry into a hard, tough, immutable mold that makes the mess magnificently insoluble.

What useful effect have the Black Power advocates ever achieved? What social and civil changes have they ever produced? Mainly, they've served to make Southern Senators really solidly and immovably determined to filibuster till the end of time before yielding to the arrogant, belligerent threats of gun-waving Black Power screamers.

To the individual white who is psychologically incapable of adapting to a new order of life—and I mean *incapable;* genuinely, truly as incapable of adapting to a change as an intensely neurotic claustrophobe is to adapting to riding subways or elevators—the Black Power extremists are no real threat.

Violence, and violent-approach techniques simply harden attitudes; there isn't a chance of accomplishing anything—except some slaughter—if any halfway rational consideration of facts is allowed. It's perfectly obvious that an eruption of Black Power extremists into rebellion will drive white extremists into happy counterattack, and force ordinary decent white citizens to suppress the murderous attackers. Since whites outnumber Negroes nearly ten to one, and some eighty-five percent of all the Negroes in the country are just as thoroughly

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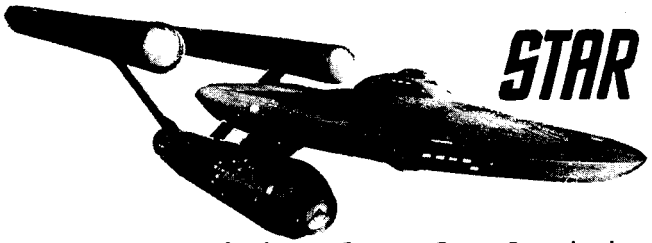

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uninterested in violence as any other decent citizen, the result would be highly destructive, cost tens of thousands of lives, and eliminate the Negro as an important social force in the nation.

Democracy rests on the idea of the will of the majority. Make it a test of arms, and . . . guess what! The will of the ten to one majority will prevail in a quite democratic way. You can, you know, substitute bullets for ballots—but the voting comes out the same way; the majority rules. It's just more costly.

And if such a thing came to pass, none but the most utter fool could expect the whites, having suppressed the rebellion, at great cost in lives and property, to be in any mood to give the remaining Negoes the faith, goodwill, and trust they had before. Want to find out what "ghetto" *really* means? Just let such a rebellion get started, and the result will be what some Black Power extremists have been asking for—a separate Negro nation. Something somewhere between a reservation and a prison camp. It'd take three generations or so for the Negro to win back to the status he has now.

You really can't turn against a neighbor, kill his father, his sister, and wound him, destroy his home and business, and expect him to welcome you as a brother next week, you know.

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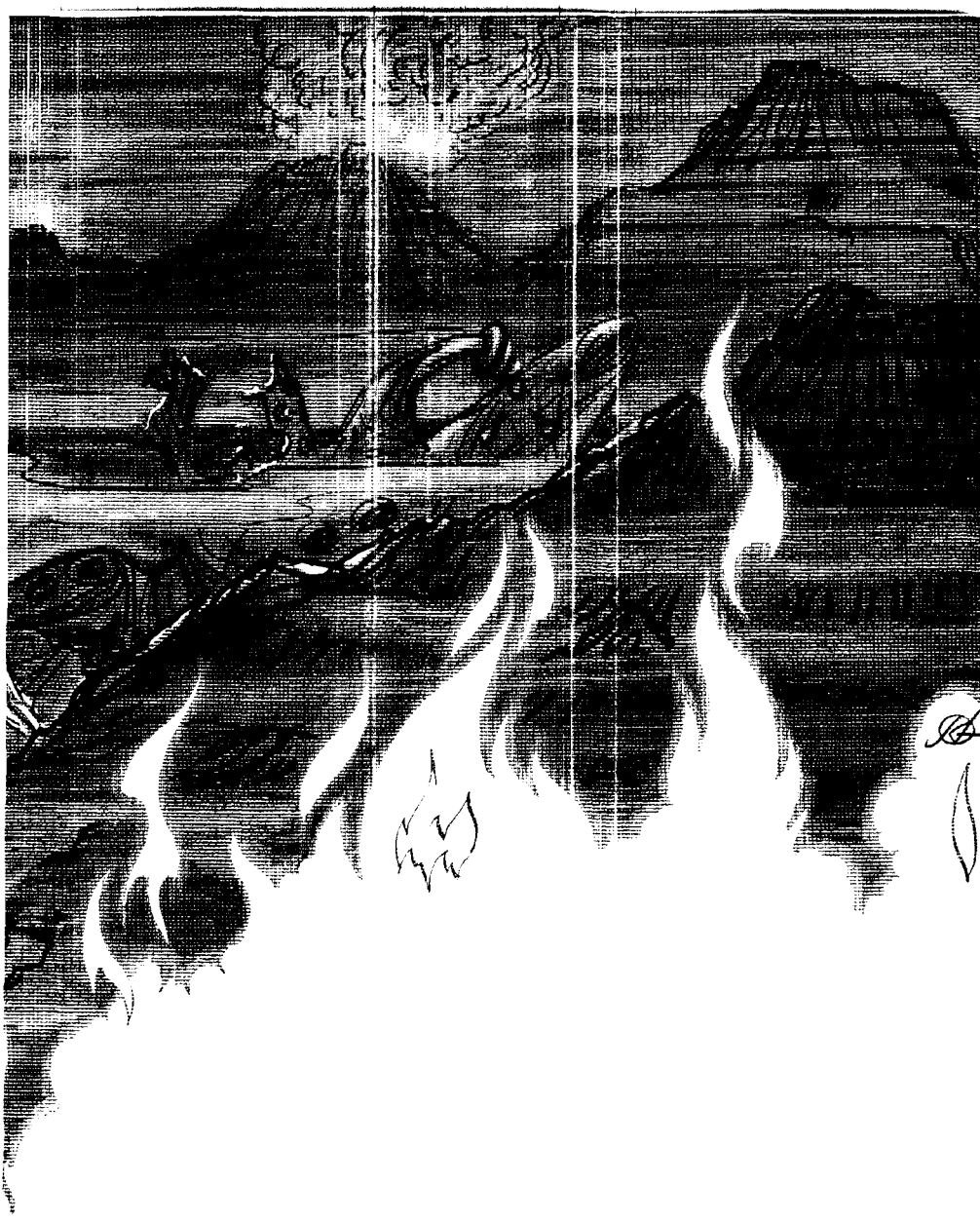

Bruce Daniels

THE BAALIM PROBLEM

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It's not necessarily true
that things that are good for you must be pleasant—
and a beneficent alien might be very uncomfortable!

Illustrated by Kelly Freas

Bucking his whistling ship through the atmosphere, Paul Scott cursed with a fluency unusual even for his fiery, Outworld temper. Why hadn't he stayed at his ranch on Vorn instead of agreeing to play cloak-and-dagger? According to the records, no one had ever made a successful landing on Baalim. And aliens or no aliens, it was highly unlikely he would be the first. The terrified lowing of the cattle in the after compartments wasn't helping matters either.

It was a fool's mission, and he knew it. With the catastrophic turbulences outside, his instruments were unreliable. The viewers revealed nothing but spasmodic patterns of raging duststorms and volcanic gases. Even the infrared scanners showed only a blur of overlapping hot spots, punctuated here and there by large cool areas which could be anything. But, by Thorn, the answer was down there somewhere! He'd come a long way to find it, and not all the fires of hell were going to stop him from getting what he had come after!

Cursing the stubborn pride that had got him into this predicament, the rancher grasped the controls more firmly and pushed his buffeted ship through the maelstrom toward the largest of the cool spots. He hoped, by the seven mad gods of Zom, that it wasn't an ocean. The cows bellowed an echo to his prayer.

Meanwhile, half a world away, First Captain Jon Burld studied the instruments in his orbiting Federation cruiser and grunted. No sign of the Outworld ship which had been mysteriously circling Baalim on the last revolution. It must be somewhere in that churning hell below. The damned fool! Burld cautiously estimated the odds against making a safe touchdown at more than thirty to one. Still, the Outworld ship must be connected

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with the alien puzzle somehow, and the answer had to be on Baalim.

Fishing the command disk from his uniform pocket, First Captain Burld dropped it in the reader and restudied the significant paragraph of his orders: "Having ascertained the truth, or falsity, of the aforementioned reports, First Captain Jon Burld will, at any cost, locate and investigate the alien ship or ships, identify the nature of the aliens' mission and, if possible, their planet of origin, and determine the gravity of the threat presented to the Federation and to other planetary systems by their presence in this sector of space."

Burld grunted again. The orders were clear enough. "At any cost." Throwing a mock salute toward the Outworlder lost in the storms below, he alerted the cruiser's pilot-computer and checked the fastenings on his safety webbing. The computer began to take the ship down.

"You are Paul Scott, of Vorn?"

"I am." The galleries of the massive, stone Council Hall were deserted. Only six men faced Scott across the circular table, the six-system representative who made up the Cooperative Council of Outworld systems. Scott stood impassively, waiting for the Chief Councilman to continue his questioning. Inwardly, however, his mind was in a turmoil, wondering why he had been summoned to this secretive, late-night interview. Normally the Council met only to discuss state matters of mutual interest to the independent Outworld systems, not to ask inane questions of minor ranchers.

"Your record is impressive for a relatively young man, Paul. You served well in the military, distinguishing yourself in the Breesch and Kymos campaigns. Your ranch is already one of the most prosperous on Vorn, and your planetary subcouncilman informs us that your plan to crossbreed Vorn stock with stock imported from other systems could solve the calc-pest problem."

Scott said nothing, still waiting.

"Have a chair, Paul, and tell us what you know about the aliens."

Scott seated himself stiffly at the table, trying to conceal his impatience. What sort of childish guessing game was this? The encountering of alien life forms had been a disturbing possibility ever since man had first erupted into space in the dimness of prehistory. But as humanity had spread throughout the star systems, the possibility had dwindled to an idle topic of speculation. And now, with the myriad empires jostling each other across the galaxy, the alien myth was little more than humorous folklore.

"Aliens? I breed cattle!"

The chief councilman considered Scott's reply, weighing its impertinence. Then he nodded in satisfaction. "As you know, we Outworlders are rather on the edge of things.

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Yet even in our semi-isolation, we must have knowledge of the happenings of the galaxy if we hope to survive and profit. In part, we rely for this information on trade and commercial missions. To a large degree, we also depend upon our computer network, which is linked by subspace communication with its counterparts in the Federation and other nearby systems. No government can permit its neighbors to have full access to its internal information, of course, but we have found that a limited amount of reciprocal interplay between networks is advantageous."

"What has this to do with me?"

"Two days ago, Paul, our computer network was informed that a distress buoy was found drifting near Vaulk III. The Vaulkians have since clamped a Security blackout on the matter, but we do know that the buoy was of strange design and workmanship, and was broadcasting signals in a totally indecipherable language."

"By Thorn! Then the aliens aren't a myth!"

"Patience. We don't know that for sure. If there are aliens around, the Outworld systems will want to know about it. The computer network has concluded a high probability of a single alien ship in difficulty somewhere in the fourth quadrant." The chief councilman's face softened into an amused smile. "However, we Outworlders do not place as much reliance on machines as do some of our neighbors. If the Council is to recommend a course of action, we prefer a human evaluation to work from. You have been recommended to us by your planetary subcouncilman as a trustworthy and resourceful agent. With your frequent stock-buying trips, you are familiar with other systems and should be able to move freely and without suspicion. We want you to investigate the mysterious buoy, find out what you can about the aliens, and report back. The Council will pay your expenses, of course, so you will be getting a free trip. Will you accept the mission?"

Scott considered the proposition for several minutes. "I've been meaning to look over that new mutant breed of Vaulkian cattle. Yes, gentlemen, I'll take the job."

First Captain Burld's briefing had been extensive, but routine. "That's it, Burld," the vice commodore had concluded. "The distress buoy on Vaulk III. Probably an alien ship, or ships, lurking nearby. If so, the Emperor must be warned and defensive measures taken. Personally, I think we should send a fleet to blast the information out of the Vaulkians and track down the aliens. But Computer Central says a one-man search has a better chance. You're rather junior for this assignment, Burld, but your card popped out so you must have the qualifications. You have your orders. Good luck, First Captain."

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Now, five days later and resplendent in his most formal uniform, Burld sat across the desk from a perspiring official of the Vaulkian admiralty. "Damnit, what do you mean you never got the request! The Federation sent through a notification of routine fleet maneuvers in this quadrant eight weeks ago, requesting clearance for limited passage through Vaulk-patrolled space and confirmation of the normal commercial refueling arrangements. The request was acknowledged and receipted by your Communications Central and routed to this office."

The official wiped his balding brow nervously. "That's impossible, First Captain. If we had received it, I would have some record of it here. If you wish, I'll call Communications and check on it."

"Great Moons of Mibbor!" Burld thundered. "Didn't you hear me say I've already checked it through Communications? The message was routed here!" Burld glanced at his wrist chronometer. "I don't know what kind of a game you're playing—calculated insult to the Federation or plain incompetence—but when our fleet is fired upon because some overzealous junior officer never got the word it was a routine exercise, I'd hate to have the fate of Vaulk on my conscience!"

"You thr-threaten war?"

"I threaten nothing. I state the facts. My government sent me to determine whether there has been an intentional snub to the Emperor's honor. I had thought, if it was an honest mistake, to give you a chance to admit your bungling and rectify the error. However, since you do not choose to cooperate, I see no choice but to let our ambassador take it up with your superiors." Rising from his seat angrily, Burld started toward the door.

"No. Wait, First Captain." The Vaulkian clawed helplessly at the air. "I mean, perhaps you're right. It could have been an honest mistake. My staff, you know. It's hard to get competent help these days."

Turning, Burld regarded the gibbering official with a stony scowl. "It was your error then?"

"Well, ah, shall we say the fault was with this department. But I'm sure we can take care of it. Do you have the details of the fleet movements and fuel requirements with you?"

"I have a copy of the original request here. But snap it up. I've wasted enough time on this matter already, and I have an appointment with the ambassador."

The Vaulkian spaceport was a blare of confused noises and harsh sunlight. Yet little noise and even less light filtered through the grimy windows into the ramshackle office in the corner of the spaceport.

"It's all set then. The van will deliver the cattle this afternoon. Your crew will have them loaded in

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my ship so I can lift off for Vorn before dark?"

"Sure thing, Mr. Scott. I've been handling towage and cargo at this port for eighteen years. Haven't lost a load yet."

Scott leaned back in the creaking swivel chair and smiled at the gnomelike comptroller behind the paper-littered desk. "I'll bet you've handled some strange jobs at that. Doubt you've ever had anything to compare with a shipload of space-sick cows in free fall, though. Ugh, what a mess!"

"Wouldn't be too sure about that. *Had a weird one just last week.*"

"Really? What was that?"

"Some sort of funny-looking dingus. Sort of like a distress buoy, only bigger. Never seen anything like it. Space boys found it drifting around up there, cluttering up the place. They got right excited about it. Didn't just read it and blow it up like usual, no sir. Had to send one of my tugs up to pull it in. Wasn't designed for reentry. Had a devil of a time manhandling it down here."

"What happened to it?"

"Oh, they got it stashed in that small hangar over the other side of the port yonder. Lot of to-do and brass swarming all over it at first. Still got a couple of guards at the hangar entrance."

"Any idea where it came from?"

"Nope. I can show you where we picked it up on the charts, though."

"Great. I'd be interested in hearing how you went about handling a big job like that. Why don't you show me the charts, then I'll buy you a drink."

"That should take care of the fleet exercise, First Captain. I apologize again for the misunderstanding."

"Think nothing of it, Mr. Folg. Glad we got it straightened out." Burld glanced again at his chronometer. "I've got to run. Oh yes, one other thing. I have to duck into Security and check out a few details on recognition signals and the like. *They're right across the hall, aren't* they?"

"Yes. I'll walk you over. I doubt anybody's there right now, though. Probably all at lunch."

"That's all right. I can take it up with one of the secretaries. When the ambassador and I talk to the admiral this afternoon, I'll be sure to tell him how cooperative you've been, Mr. Folg."

The two hangar guards stiffened as the covered van careened wildly down the pavement, caromming off a steel pole and finally crashing into the next building. From the rear of the van, eight terrified cattle scrambled, milling aimlessly about and bellowing raucously. One of the two bulls, finding a target for his indignation, charged the guards, who scrambled to safety behind a pile of crates. In the confusion, no one noticed the quick

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Outworlder who slipped into the distress buoy's hangar carrying a camera and an analysis kit.

First Captain Burld shifted impatiently, consulting his chronometer again. The secretary shrank away from him nervously.

"I'm sorry, sir. Commander Marlon should be back from lunch soon."

"Look, miss, I can't wait. I'm late for my appointment with the admiral. Why don't you just give me that file on the alien buoy now? I'll see Commander Marlon and sign the receipts later."

"I couldn't do that, sir. It's classified material."

Burld towered over the girl angrily. "I know that. I wouldn't be here otherwise."

"But I can't . . ."

"Now look here, young lady. I am a First Captain in the Federation Fleet. I am here to discuss this alien business with some of the top-ranking officers of your fleet. I am fifteen minutes late for that conference now. And I must have that file immediately. You heard Mr. Folg vouch that I am on important business and that you are to take care of me when he brought me into this office. You also heard us discussing my meeting with the admiral. Now, if necessary, I will report to the admiral that the conference must be canceled because his Security staff can't interrupt their long lunch hours and because his secretaries are incapable of recognizing emergencies. The Federation will survive without the conference. I doubt, however, that you and Commander Marlon will!"

The secretary chewed her lip in agony, fighting back tears. "Well, if you're sure it's important."

"I'm sure it's important! Now get me that file. I'll receipt for it right after the conference."

The Vaulkians were very understanding about Scott's runaway cattle. The careless driver Scott said he had hired to drive the van could not be found. But the damage done was slight, the amount of money which surreptitiously changed hands was more than ample, and the cosmopolitan Vaulkians reaped great amusement from the backward Outworlder and his efforts to round up the scattered beasts. It was a little after dark when Scott lifted ship.

Once clear of Vaulk III, the rancher drew a deep sigh of relief and sat down to consider his next course of action. On the surface, he had accomplished what he had set out to do. The Vaulkian cattle would make an important addition to his herd. He had photographs, metal samples, and detailed descriptions of the alien buoy and the conditions of its discovery. The logical thing would be to report to the Council and get back to his work. But his nagging pride kept telling Scott that the job was only half

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done. He still didn't know where the buoy had come from.

The presence of the aliens in this sector would have a major influence, one way or another, on the security, prosperity, and development of the Outworld planets—and upon Scott's own ranch. Granted, the Council had only asked him to find out what he could, but his information on the buoy was inconclusive. It was hardly enough to permit an intelligent appraisal of the situation or base any effective plans and policies on. Scott shrugged. It would be nice to adopt a bureaucratic attitude and say that assessment and planning were the Council's responsibility, but he knew they weren't—at least in the Outworlds. As an independent rancher, he had to decide his own fate and future. And for that, he needed more information.

Backtracking from the buoy's final course and position, Scott studied the star charts puzzledly. The buoy's surface had shown the effects of the awkward reentry into Vaulkian atmosphere, but the relatively unpitted surface ruled out any extended trip. Even in deep space, a noticeable amount of erosion would have resulted if it had been a derelict from outside the sector. But within the sector there was nothing. The nearest system in the buoy's path was a tiny dwarf star with a single, uninhabitable planet, Baalim. Still, if there was an alien ship in distress, it would have had to make for Baalim. And who knew what was "uninhabitable" for aliens.

Hesitating, Scott shrugged again and went aft to check on the cattle. Then he changed course for the dwarf star.

When the pitching Federation cruiser finally rocked to a halt, First Captain Burld braced himself for a crash. But when, after several seconds, nothing else happened, he opened his eyes again. He was down!

It had been a close thing getting off Vaulk III before his trickery had been discovered, and there was bound to be an inter-system fuss about it. But he had sent a coded message off to Federation headquarters. It was heady business ordering out the mammoth Federation fleet at his rank, but the vice commodore had seemed anxious to deploy the fleet to guard against the "alien menace." He felt sure his recommendation would be accepted. And once the fleet appeared over Vaulk on the maneuvers he had so conveniently concocted, he doubted the Vaulkians would pursue their protest too violently.

Meanwhile, he had problems of his own. The Vaulkian intelligence summary on the alien buoy made Baalim his obvious target. Getting down had been a miracle. But now he had to find the alien ship, if it existed. There was also the Outworld ship to consider. Burld vaguely remembered an Outworld ship at the spaceport when he had landed on

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Vaulk III. Its presence here on Baalim could only mean it was tied into the situation somehow. He would have to be armed and ready for trouble.

With the high volcanic activity on Baalim, the communications bands were a stammer of static. However, a few seconds before touching down, he thought he had picked up a weak signal from the east, broadcasting on the same wavelength that the alien buoy had used. Suiting up, Burld unloaded the scout crawler from the cruiser's hold. It was little more than a cramped, one-man life-support capsule slung between caterpillar treads, but it was capable of making slow but steady progress over almost any kind of terrain.

The next three hours were among the most uncomfortable that Burld could remember. The landscape was a nightmare of jutting rock and solidified lava flows, etched into paranoid shapes by the scouring winds and sand. Visibility was limited to a few feet, and the filtered glow of volcanic fires that surrounded him added to the netherworld impression. Slowly, jouncingly, tortuously, the crawler inched its way eastward. But the indecipherable signals on the alien wavelength grew stronger despite the static. And finally, rumbling his crawler over a rocky ridge, Burld thought he could make out the shadowy form of a ship below him.

What happened next, Burld was never sure. The thin lava crust covering a gigantic air bubble collapsed under the weight of the crawler's treads. The crawler lurched sideways, tilted dizzyingly for a moent, then rolled end-over-end down the slope, crashing to rest against a sharp outcropping. The cab capsule was split open and Burld pitched brutally upon the jagged rock.

Grinding his teeth against the searing pain from his right leg, First Captain Burld opened his eyes and stared with disbelief into a great, shaggy-snouted face, surmounted by two long, downward dropping horns.

"Are you all right?"

Burld swiveled his head, trying to locate the source of the voice on his helmet radio while keeping one eye on the hairy monster standing over him. "I'm alive. Think my leg is broken. Who are you? And who—or what—is this . . . this . . . ?"

"Relax. The bull won't hurt you. He's just curious. Let's get you out of this sandstorm. We can talk then."

A spacesuited figure materialized out of the gloom, and half walking, half dragging, pulled him toward the alien ship. Burld must have passed out. When he came to, he was inside. His spacesuit had been removed and a lanky Outworlder was just finishing fastening an improvised splint around his leg.

Burld grunted in pain. "My thanks for being there to catch me. I'm First Captain Jon Burld of the Federation Fleet."

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The Outworlder studied him suspiciously. "I'm Paul Scott. I gathered as much from your uniform. When that tank of yours came over the hill, I wasn't sure whether I was under attack from the Federation or whether you were one of the aliens."

"Aliens?"

"Let's not play games, First Captain," the Outworlder said. "Your presence here can only mean that the Federation is somehow connected with the aliens—or at least shares our curiosity and concern about them."

Burld winced in pain again. "Where are we? And what was that shaggy thing out there? One of the aliens?"

"We're in the alien ship—or what's left of it. It crashed, as did mine a mile or so over. No sign of any aliens, living or dead. The thing you saw was nothing but a prime Vaulkian bull I was shipping home for stud purposes."

Burld gagged as a cloud of sulfurous fumes swirled in through a crack in the cabin wall. "Hadn't we better suit up again?"

The Outworlder gave him a wry grin. "You Federation types sure are fastidious about the air you breathe. Put your helmet back on if you want. But the air's breathable, however unpleasant. I checked it before I let the cattle out. It's the sand out there that's the killer."

"You say there's no sign of the aliens?"

"None at all. The ship's been stripped of anything that might give a clue to their nature or origin. Supplies, seats, control indicators, everything. Except for this block, which I found in one of the supply lockers, we could be in the hulk of a normal merchant vessel."

Burld glanced at the small black metal cube which the Outworlder had handed him. It seemed to have

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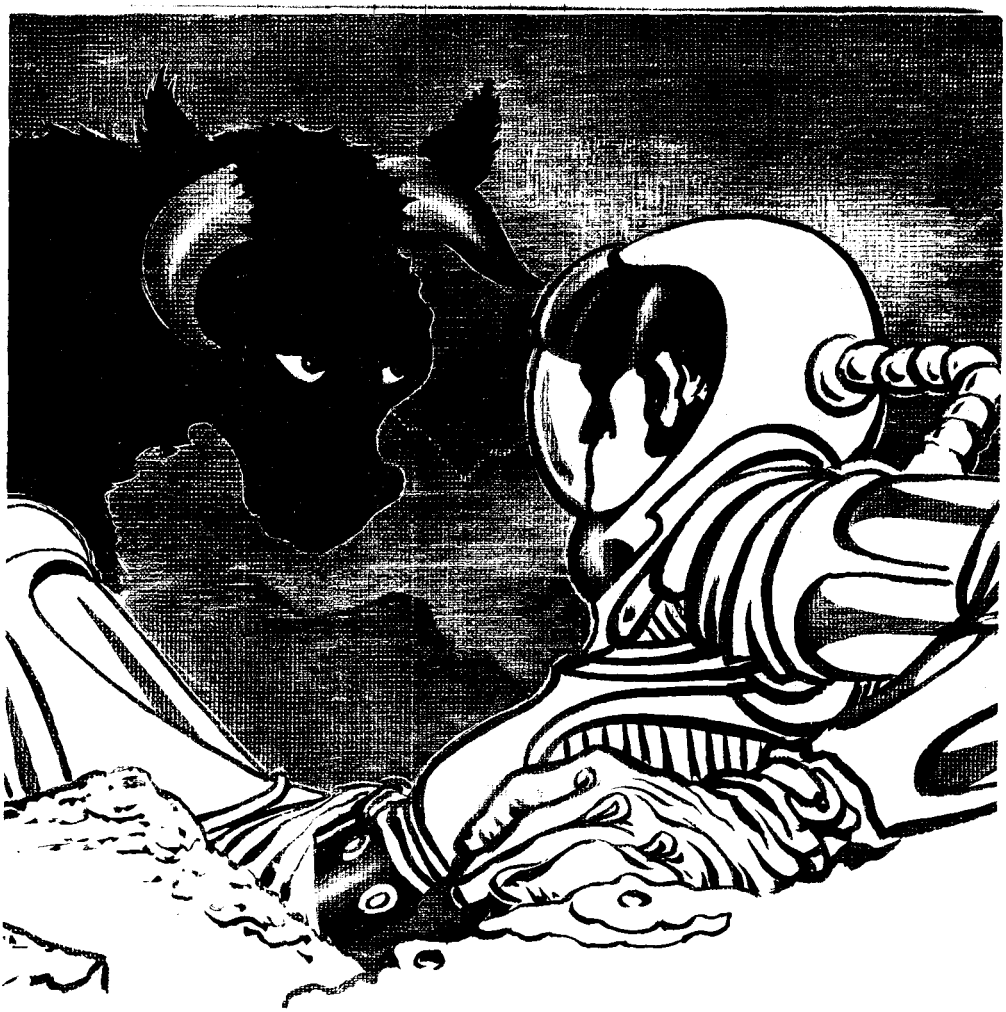

markings of some sort etched deeply on three of its sides. "There must be some clues."

"Oh sure, there are some. Doorways, hatches, and lockers, conform generally to human size and proportions. I can't make much out of the controls, but the drive system seems to work on the same principles as ours. There's a continuous replay system hooked up to the communications system. The message it's sending is gibberish and the system has a few modifications in it, but nothing markedly different from a standard set."

Burld grunted. "It's just like that damned Vaulkian buoy. It was strange, all right, but *different* not really *alien*. Slightly different approaches in design and workmanship, but basically constructed along

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the same principles. It would seem to indicate the aliens have a similar culture of about the same level of technological development as ours."

Scott shrugged. "Perhaps. What do you make of that cube?"

The first captain examined the black metal cube more closely. "Seems to have pictures scratched on it. I can't make them out too clearly. The details are indistinct. But they seem to be creatures of some sort. This one's a quadruped of some sort grazing in a field. This one's humanoid. And what's that? Some sort of three-legged bird? Let's look at it under magnification."

"Won't do any good. I've already tried that. It's funny, but the backgrounds are etched in deeply and clearly. Look at that first one. You can see the field and the mountain and the rising sun quite clearly. But the images of the creatures seem to have been left intentionally vague and indistinct. All you can get is a kind of general impression of an animal in a field."

"What do you suppose they are? Pictures of the aliens?"

"Who knows? Snapshots of home? Identification photos? Maybe even pin-up pictures? I don't suppose it makes much difference. We aren't going to get home to tell anyone about it."

Burld grunted. "I guess you're right. No chance of getting a distress signal out from your ship through all this static?"

The Outworlder shook his head. "I tried. How about your ship? I understand you Federation types have more sophisticated equipment."

"My ship? If I could get to my ship, I wouldn't have to worry about a distress signal. I could lift off."

"Your ship didn't crash?"

"Hold it, Outworlder. Don't get any fancy ideas. The pilot-computer's keyed to my personality. You couldn't be able to activate it or even use the communications gear. So you can't leave without me. And it's fifteen or twenty miles west of here. I'll never be able to get to it with this leg."

"A ship! By Thorn! We'll get you to it, First Captain. How big is it? Can it carry two men and eight cattle?"

"Cattle? You don't mean you'd try to take those shaggy pot roasts with you?"

"As far as I'm concerned, those cattle are more important than this alien ship. I came here with them; they'll go with me if I leave. Besides, it's those 'shaggy pot roasts' that are going to get you to your ship. You can't walk, and I certainly can't carry you twenty miles in that sandstorm outside."

"I don't think even your cows can. Have you seen what it's like out there?"

"Cattle. Only six of them are cows. Besides, you understimate them. Man prides himself on his

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adaptability. But cattle can survive under most conditions that man can, and do it without most of the gimmicks and protective devices that man uses. I'll have to rig up some kind of face masks to shield their eyes and nostrils from the sand, but they'll take us there."

"You're mad!" Burld considered the situation. "We'll have to scrap all the excess gear we can pull out of the cruiser. But if you can get us there, I think we can lift the weight."

The Outworld rancher studied him speculatively. "I'll make a deal with you then, First Captain. My cattle and I will get you to your ship. In return, you take us to Vorn so I can make my report on this alien ship."

"It's a deal," Burld said. "As soon as I get back to the Federation, I'll see you're transported to Vorn."

"That's not good enough," Scott insisted. "It would take too long. You deliver us first."

The Federation first captain grunted impatiently: "Look, a minute ago we both thought we were stranded here. Now suddenly we're fighting over who gets home first. I'll compromise with you. We pool whatever information we have and I'll drop you at the nearest neutral port where you can get fast transportation home. O.K.?"

The Outworld rancher hesitated suspiciously. "It's a deal. You rest. I want to finish getting pictures of this ship. Then I'll rig up a sled and the face masks."

Once back in space, Scott and Burld relaxed as much as their cramped accommodations would permit. They had had to squeeze one of the smaller cows into the control cabin with them to make it, but they managed to get all eight of the beasts aboard, and had laboriously lifted free from Baalim's psychotic atmosphere.

"I've made prints of the Vaulkian report and pictures and analysis scans of all the samples, including the cube. I'll drop you and your caravan at Nexor, Scott. You should be able to pick up an Outworld merchantman there. Thanks to you and your damned cows, the cruiser can get me home in spite of my leg."

"What are you going to report when you get back?"

The first captain paused to weigh his reply. "I don't know for sure. We don't have much to go on, do we? This whole situation doesn't feel right. If it was an alien ship, what happened to the aliens? And why, if they were so concerned about disguising their presence, did they send out that buoy in the first place? It's just not logical. Either they wanted someone to find them, or they didn't."

"Maybe somebody did, Burld. Maybe another alien ship picked them up."

"Possibly. But then why leave the ship's distress call playing? They were thorough about everything else."

"Except this cube. I wonder if

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it really was overlooked accidentally. Maybe it was purposely left as a clue."

"Not much to go on there. A four-legged creature in a field. A humanoid shape looking up at the sun. And some sort of hunched bird or something. It's a riddle to me."

The Outworlder frowned. "All three of the pictures have one thing in common. There's a clear picture of what looks like a sun in each one. What's the significance of that?"

Burld shrugged. "Maybe to tell the time of day? That last picture is obviously a sunset."

"And the first one is a sunrise." Scott eyed the Federation first captain narrowly. "That still doesn't tell us much, does it?"

Burld grunted. "I guess we'll have to leave it for Computer Central to figure out." He studied the Outworlder out of the corner of his eye, trying not to appear to do so. "Well, it's six hours until we get to Nexor. I'm going to get some sleep."

"Not a bad idea."

The Vaulkian cow mooed uncomfortably.

First Captain Jon Burld, his leg still in a cast, gestured to the pile of diagrams and photographs before the vice commodore. "And that's the story, sir. On the basis of my observations, I feel confident in reporting that there are no aliens operating in this sector of space and consequently there is no immediate threat to the Emperor or to the Federation. Apparently Outworlder Scott didn't tumble to the meaning of the cube, but its meaning is obvious once you think about it. A four-legged creature at sunrise. A humanoid at midday. And a three-legged whatzis at sunset. It's a variation of the ancient riddle of the sphinx: 'What walks upon four legs at morning, two legs at noon, and three legs at evening?' And the answer is . . . Man. The whole alien thing is a hoax, perpetrated by parties and for reasons unknown. An investigation into the motive for the hoax should be made, but that decision will have to be made at a higher level."

"Then you have no idea what was behind this hoax, First Captain?"

"If I may say so, sir, I have some fairly definite private opinions about who was behind it. I will be glad to discuss them with you privately, sir. But I have no proof. As far as my official report goes, no sir, I have no idea."

The six men of the Outworld Council faced Paul Scott around the table. "Thank you for you report, Paul. Your expense vouchers will be paid within two days. We agree with your interpretation of the cube."

"First Captain Burld tried to pretend he didn't understand the riddle," Scott said, "but I'm fairly convinced he did. If not, somebody in the Federation must have remem-

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bered the ancient writings by now."

"It's nice to know that we can discount the alien scare at least."

Scott laughed out loud. "On the contrary, gentlemen. I believe the whole charade was instigated by aliens."

"What? I thought you said the ship and the buoy were manmade and put there as part of some elaborate hoax by human beings."

"That's exactly what I said. There are no outer-space bugaboos operating in this sector. The decoys were manufactured and put in place by men. But the whole thing was conceived and directed by aliens."

"You're contradicting yourself, Paul."

"Not at all. Look at the situation. It seems pointless. Who did it? The Federation? The Vaulkians? Some of our own people? There'd be no reason for it. Nobody profits. Nobody gains an advantage. Besides, the high-level concern about this thing was too genuine for any of the empires to be knowingly involved in it. Yet at least one of the empires has to have been involved. The resources and effort involved in putting all the pieces in place are too great for any but a major power to have supplied—either wittingly or unwittingly."

"Then you are suggesting some cosmic puppeteer, pulling strings and making mankind do things we don't realize we're doing?"

"Something like that. The whole problem is with the term 'alien.' We've all been running around visualizing some bug-eyed monster from outside the galaxy. But there are aliens among us. An alien is simply a nonhuman life form. Look at the legends. Our fear of encountering the extra-galaxy aliens goes back to the earliest days of space flight. But there's another fear that, I suspect, goes back even farther than that. And that's that our thinking servants would develop the power of independence and, in turn, start to manipulate us. In the beginning these fears were groundless, of course. And in the hundreds of years that have gone by since, we've grown quite comfortable and complacent about living with computers. But in that same period, the computers themselves have been immeasurably improved and given more and more authority.

Look at the Federation ships. First Captain Burld told the ship what he wanted it to do, but the ship took him there without any effort on his part and, I might add, better than I could have—better than I did with my own. He got down on Baalim; I cracked up. Look at the Federation itself. It's Computer Central, not the Emperor, that really runs the show and directs the monumental bureaucracy. For that matter, even we Outworlders, who pride ourselves on our independence and initiative, depend to a great part on our computer network to tell us what's happening in the world. You told me so yourself."

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The six men of the Council looked at each other.

"Who else could have manipulated the resources necessary to alter the ship and build and place the buoy adrift without anyone having an overall view being aware of it? I suspect both Federation and Vaulkian units had a hand in it, carrying out routine orders without any idea of what they were really doing. And who called the 'alien threat' to your and the Federation's attention in the first place? The computer networks—conveniently linked by subspace communications so they could talk to each other and coordinate their activities. I submit, gentlemen, that the authors of this whole hoax have been our own pet aliens, the computers."

"But—"

"As to why they did it, I've been giving it a great deal of thought on the trip back. I think I can guess why they did, but you'll have to figure it out for yourselves. You wouldn't accept my explanation if I gave it to you. And my telling you wouldn't do any good anyway. The answer will have to come from the people generally. Now if you'll excuse me, I want to get back to my cattle."

In his private quarters, the vice commodore leaned back in his armchair and lighted his pipe. "Then you think the computer net set up the hoax for some purpose, First Captain. Why? Because it wanted to put us on the alert? Because it suspects that real aliens are operating nearby and we should be ready to meet them?"

"No," Burld said. "I could see a fake alien ship to get us excited about an alien threat. But not such a crude and obvious hoax. Why set up an elaborate dummy, and then leave the cube to announce that it's a hoax and that there's really nothing to worry about? No, I believe the computer net set it all up as a test of something else."

"A test?"

"It has to be a test of some sort. Why else set it up the way it did. We could have sent a fleet into Vaulk after the information. And a properly armed and equipped search party undoubtedly would have had an easier time getting down on Baalim and lifting off again. But the computer net specified that we send a one-man probe. That should have made us suspicious right at the start, Why limit each side to one player unless the point is to make it almost impossible for either side to be successful?"

The vice commodore puffed thoughtfully on his pipe. "I'm not sure that I follow you."

"Look at the men who were picked. Representative types. Scott was the kind of man sure to be selected for the job by the Outworld Council. Arrogant, cocky, but highly independent and resourceful. The epitome of their way of doing things. Turn him loose with a free hand and you can bet he'll figure out

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some way of getting what he's after. Look at how he handled the Vaulkian angle. He didn't have anything behind him but his own initiative, but he got the information on the buoy."

The vice commodore frowned, but his mouth twisted into just a hint of a grin around his pipestem. "And, ah, yourself?"

"My apologies, sir. I'm not trying to flatter myself, but I also am fairly representative. I must be. As you yourself said, my card popped out so I must have the qualifications. I'm a good officer and a competent bureaucrat. I know how to work within the system and make it work for me. Otherwise I wouldn't have been able to get the Vaulkian intelligence summary. And, of course, I was backed up by the authority and devices of the Federation itself."

"Then you think it was some sort of a game, or test, to see which world system or type of government would win?"

"Not exactly, no. It looks to me as if the computer net established a situation in which neither side had much chance of winning, but in which, with cooperation between the two sides, there was a high degree of probability that both could be successful."

"To what point?"

"I don't mean to lecture, sir, but consider the galactic situation in our sector. We have the jealously independent Outworlds, barely able to get along with each other much less with other systems, marked by suspicion and distrust. They're held together by a common cause of self interest only. Then we have our own Federation, so vast, rigid, and cumbersome that it's really incapable of any purpose except concentrating on self-continuation. We're so thoroughly bureaucratic that it's almost impossible to get cooperation within our own operations. The thought of honest cooperation with an outside system is a joke."

The vice commodore watched a puff of tobacco smoke drift toward the ceiling blower. "You were wise to keep such comments off the record," he said.

"And then, of course, there are the tiny, greedy empires and would-be empires like Vaulk. They're pathological in their distrust of everybody. Somehow all these arguing, growling, snapping systems have managed to exist so far side by side in one small sector of the galaxy. They've survived, but only because they haven't had anything to worry about but each other. Suppose that some new, greater threat existed—maybe even the real aliens we were talking about. Something that none of them could face separately, but which would require the coordinated efforts of all of them. Could they act in unison to meet it?"

"Are you asking me, or is that a rhetorical question? I think the answer is obvious."

"The answer is obvious only if you're content to accept a negative

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answer. And I think that's the problem the computer net is faced with —the real Baalim problem. I think the possibility, or probability, of some overwhelming problem exists —how real or how imminent, I can't guess—and the net has to find some way to weld this multitude of distrustful worlds with their innumerable petty suspicions and separate gods and philosophies into one coordinated force to meet it. This particular hoax, in my opinion, was just a trial run to get more information, a small test to see if men of different systems and orientations can work together successfully."

"Assuming that you're correct, First Captain, how do you think we scored on the test?"

Burld studied his superior officer thoughtfully. "I wish I knew. Very probably we failed. We did share the more obvious data, and it was through our joint efforts that the Outworlder Scott and I got off Baalim, but there was always an element of distrust between us. We each withheld the key to the problem—of course, we didn't grasp its implications then, but we continued to think and act in terms of Federation versus Outworlds even while we were saving each other's lives."

"Your conclusion then is that greater efforts must be made by the Federation to achieve cooperation and accord with the other systems . . . for our own protection and survival? If you're right, it's an important part of your findings. Why didn't you include it in your official report, First Captain?"

"There'd be no point to it, sir. That's why I asked for this private conference. If a lowly first captain suggested that the survival of our mighty Federation hinged upon greater cooperation with the Outworlds and dwarf empires like Vaulk, I'd be laughed out of the fleet. I'd be branded as unstable and my career would be finished."

"You mean you're ducking the issue? Isn't that cowardice?"

"If you wish to interpret it that way, sir. But as a somewhat junior officer with a spotted record, there would be little I could do to help the situation. I've passed my suspicions on to my superior officer. If you agree with me, you're in a better position than I am to do something about it. And you'll have the computer net to back you up. In any case, along with my formal report in your office, you'll find my request for transfer. I'm asking to be reassigned to a consular post somewhere—preferably in the Outworlds. Perhaps I can do something useful to the situation there. I'd like to meet Paul Scott again and get to know more about his cattle ranch. His cows may save the Federation."

The vice commodore studied his pipe bowl. "Perhaps, First Captain. I'll have to think about it." His eyes twinkled with inner amusement. "And then perhaps we should see what Computer Central says about your reassignment." ■

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The Fuglemen of Recall

by Jack Wodhams

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The question of "Who am I?"
is pretty largely a matter of memories—which,
with a memory-transcriber gadget, could make for certain
minor confusions, let us say.

Illustrated by Leo Summers

"Darling, what are all these people doing here?" old Tunzenholt quavered. "What do they want?"

"Sweetheart," Mianda purred, "these people are only here to witness your signature on a will."

"A will?"

"Yes, dear," Mianda smiled. "You know who you are, don't you?"

"Uh? Of course," old Tunzenholt panted. "Don't be silly, darling. I'm Branshard. Your Branny, who else?"

"I know, lover," Mianda concurred sweetly. "This is a rehearsal. Now you just sign this, Simon T. Tunzenholt. Where it's typed?"

"Yes, but what for?" he said a little querulously. "Tell them to go away."

"It'll only take a minute, and then they'll go. Just sign it, Branny honey. After all, it's only a part. And then they won't bother us any more and there'll just be the two of us."

"It seems silly to me," old Tunzenholt grumbled mildly. "Still, you do like your little games. They'll go away?"

"They'll go away," Mianda promised.

"Hm-m-m. Sign where?"

"Here."

"Simon T. Tunzenholt. Sounds familiar somehow."

Mianda chuckled. "Don't worry about it. Quick, sign it. I'm impatient for these people to go, too."

Thus adjured, Tunzenholt appended the required signature to the document, and was photographed so doing. Witnesses added their names, and for good measure a notary guaranteed the facts.

The deed done, Mianda ushered her visitors to the door. Her lawyer paused in the exit. "Gunther Mitzenphiefer is staying across the way," he said quietly.

"Another one?" She didn't know whether to be happy or annoyed. "How many more, for goodness sake's?"

"Don't knock it," he advised. He glanced over her shoulder. "I won't keep you. Good luck. I'll be with

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the Rev down in the bar if you need me."

She nodded. "Right."

She closed the door. She was puzzled. She didn't understand it. She walked back into the bedroom. But why argue? As Rick said, when you're on a good thing . . .

She gave Tunzenholt a beaming hello. "Now where were we?" she said huskily.

Unknowingly she was profiting from the side effects of a new service that was being provided by Lidlun Spatial Electronic Enterprises.

"How can you turn your back on me? How can you fail to recognize me, your own son!"

"I don't know what you're trying to do, or what you think you're playing at. What's the idea? What are you hoping to gain?" Mr. Punter, Sr. growled.

"Dad, don't be like that. I know I've been away for a while, but I haven't changed that much, have I? It's not like you to . . ."

"Don't call me Dad," Punter, Sr. said irritably. "I'm not your Dad. I never was, and I never will be. Now a joke's a joke, but this has gone far enough."

"Dad, what's got into you? I'm home again. I thought you'd be pleased to see me," Punter Two said. "After the trouble I took to get away . . . What have I done wrong? Haven't you been getting my letters?"

Punter, Sr.'s eye was hostile. "I don't know what you are talking about. You are *not* my son. How you got such an idea into your head, and with what motive, I don't know. Whoever you are, you have nothing to do with this family."

Punter Two gaped. "But I'm Ron! I'm Ron, Dad. Just because I've been away a while . . . What's got into you?"

Punter, Sr. snorted. "My son Ron was home only last week. Both my boys were home. So you can stop acting the fool."

"But it's me, Dad! The facial change was caused only by . . ." Punter Two stopped. "Last week? I wasn't home last week." He frowned. "Dad, there's something wrong. Someone else . . ."

"You're telling me," Punter, Sr. snapped. "Now who are you really? I mean, you are old enough to be my brother. Now what is it, eh? Some lark the boys have got up to to pull my leg, eh?"

But no. Punter Two was the result of an early error in respect to a certain experiment at Lidlun Spatial Electronic Enterprises.

Fabel was sweating. He was in shirtsleeves. He tapped the rubber truncheon into his palm worriedly. As he looked at the figure hand- and foot-chained to a central steel pillar, he could not conceal his distress. "Robertson, talk!" There was an uncommon pleading edge to Fabel's voice.

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Spirit flickered in Robertson. "You won't trick me, you stinking warmongering fascist swine. Lackeys to capitalism! When will you wake up, you dolts?"

"Robertson, knock it off willya?" This burst from Naine, Co-Ex from Central I. and E. "You're Robertson, Shaun Finlay Robertson of Internal Security. You know that. Remember man!"

Robertson squinted with animal cunning. "You don't fool me, imperialist pigs. You have done something to my mind, this I know. But you cannot trick me. You are trying to make me believe that I am someone called Robertson—but I'm not! Do you hear? I'm not! I refuse to be tricked, do you hear? I know who I am! I'm Chin Fe d'Hai, do you hear? Chin Fe d'Hai! And you swine will learn nothing from me, do you hear? Nothing!"

Fabel looked at Naine.

Naine looked sick. "We must find out." He turned his head away.

Fabel gnawed his own oral flesh. "Robertson, I hate to have to do this . . ."

So Robertson was ill-used in an effort to recover information lost when Chin Fe d'Hai had managed to suicide with a scalpel—while a retrieving operation was being performed at the laboratories of Lidlun Spatial Electronic Enterprises.

"All right, and what do you think you're doing?"

The shocking old parody simpered. "I'm just out for a breath of fresh air, officer." He winked with repugnant archness and the officer shuddered.

"Buddy, if you don't get home and get out of that rig in a hurry I'm gonna have to run you in."

"Oh, officer, how can you be so cruel?" he chided. "A girl has a right to stroll freely in the city, hasn't she?"

"Not the way you've been strolling for the last half hour. Now beat it," the officer said, revolted and exasperated. "You're lowering the tone of the neighborhood."

"Oh. Well, really." The caricature fluffed his wig a little more askew on his bald head. "It was a different story yesterday." A tear trembled on a caked eyelash. "I can't help it if my looks are gone. I can't understand it. I'm still the same me."

"Yeah, yeah, sure," the officer said. "Just deal yourself some wheels and spin out, huh?"

The oldster shrank miserably. "I can't understand it."

The disgusted officer signaled a cab.

The painted horror tottered on bow heels across the pavement. "Last week I was the best in the business. Only yesterday . . ."

Only yesterday he had been a customer of Lidlun Spatial Electronic Enterprises.

Such events could not occur without arousing broader comment

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and sooner or later coming to the ears of higher authority. There were complaints, mainly from families, and eventually the strange happenings were brought to the notice of the QUOD of the F.J.A.

The QUOD investigated, sifted and inquired, and soon discovered a disturbing state of affairs. Even so, there were many discussions before action was taken, and their steady official patience assured that they were not as quick as they might have been.

A telephone call.

"Is that you, Uncle Ben?"

"Yes, Mercer. What is it?"

"There's a Detain and Query affidavit being made out for authorization against Lidlun Enterprises' senior participants."

"Oh? And how long will it be before it goes into operation?"

"Aw, they should be out there in a couple of hours."

"Great heavens," Rosenflaut said, "is that all the time we have?"

"Sorry, Unk. I was lucky to get the whisper as it is."

"Ah. Yes. Yes, there is that. Two hours!"

"That's it. Look, I have to go, Unk. I'd have let you know sooner if I could."

"Yes. Ah. Thanks. Good-bye."

Rosenflaut hung up. His lips shaped to cool soup. Two hours! He would have to move fast.

The two beefy men paused in the foyer and looked around. They grabbed the man who was pushing a broom across the clean floor.

"Hey, where is Mr. Lidlun's office?"

"Uh? Oh, why, straight upstairs," the man said, pointing.

"Is he in?"

"I haven't seen him leave . . ."

The two large men headed for the stairs.

The man with the broom watched them go. He smiled. He had inside knowledge.

"Are you Mr. Lidlun?"

The small man started. He rubbed one eye. "Why, yes." Then intuition brought him sharply alert.

"Mr. Hammond George Lidlun, owner and director of this company?"

Lidlun beheld the two bulky strangers. They were darkly suited and their manner was austere. "Yes. Yes, that's right. Why?" But he guessed.

One of them flipped his identification badge. "We're from the Qualifying Uses Ordination Department of the Federal Judicial Administration. We would like you to come along with us, Mr. Lidlun. There are certain suspected violations of the Innovations Code in connection with your firm, and there are some questions we wish to have answered."

"Oh." Lidlun had thought that this might happen. Indeed, he had expected it to happen, had planned

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for it as unexpected effects and side-angles had manifested themselves. He had not anticipated an official inquisition just yet, though. He had thought it would be a month, three weeks at least, before the QUOD would have enough material to act. He sighed. There went his hopes of making a hard-earned profit in the next couple of weeks. He'd been given no time to be hung as a sheep.

"Oh well, that's it then," Lidlun said. "You'll also want to question Dr. Rosenflaut and Professor Svitsorren, I presume?"

"Yes," the spokesman said without inflection. "They left the premises about an hour ago it seems, along with most of the other staff. But they will be picked up."

"Left?" This was a blow. "Really?" They might have told me, Lidlun thought. Tipped off by Ben's nephew most likely, he reflected bitterly. And they'd left him, rats from a sinking ship. . .

At QUOD headquarters Professor Svitsorren was not feeling so good. His worst fears had been realized. He had known that the incaution of Lidlun's nonchalant infractions would bring the program into swift disrepute. And now they would pay—*he*, Svitsorren, would pay. And so much for Lidlun's smart ideas to avoid retribution.

Malder looked him over. "So you're Svitsorren, eh?"

Svitsorren nodded glumly.

"Shall we take him up to Room D, sir?"

"No," Malder said. "We'll interview the three of them separately. He can go along to 126."

"The other one's been braced then?"

"Rosenflaut? Yes. He was at home packing. Collins is bringing him in now."

"Good. 126 you said, sir?"

"Yes. Sutcling should be down there waiting for you."

"Right. Professor, if you'll come this way?"

Have I any choice? Svitsorren thought gloomily. He turned in the indicated direction. He was just in time to see Bo Jeaksy, the janitor at Lidlun Enterprises, walking upstairs and conversing in friendly fashion with his companions.

So, Svitsorren thought, Bo Jeaksy has been a spy. Remembering how openly accessible everything had been to the unconsidered and ubiquitous janitor, Svitsorren's pessimism deepened and he became even more depressed. There would be no hope of pretending unawareness of the manner in which his discovery had been employed.

It was a very dispirited man who allowed himself to be taken to 126.

"Mr. Lidlun, you are familiar with the Innovations Code?" Malder asked.

"Uh, well, more or less . . ."

"I see. Well, ignorance is no excuse," Malder said pedantically. "I

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think that you are sure to have knowledge that with a novel innovation that affects one or a number of his fellows in an un-predeterminable way, a human being should not exploit the discovery without first calling notice to permit examination of the full legal implications attendant to the use of such a novelty," he reeled off. "Deliberate violation of this ethic is a serious offense and is punishable by a fine, imprisonment, or both. We have good reason to believe that your firm has transgressed the demarcation of permissibility in the most flagrant way. Can you claim, Mr. Lidlun, that this new, ah, so-called service was ever submitted to the proper authorities for evaluation towards legislatively defined limitation and allowance?"

The small man shrugged fatalistically. "We never really had time. That is, we were not sure that we were ready. You see, so much of it was experimental. Still is. The full range of possibilities has yet to be explored. We're only at the beginning. You can't really say," he said, sounding mildly reproachful, "that the reward we have gained to the moment reflects commercial avarice. Our outlay has been ex . . ."

"You have marketed an unvetted service," Malder interposed mordantly. "You have accepted monies for the performance of an illicit trade, a working unlicensed for merchandising."

Lidlun crossed his legs. From the arm of his chair his elbow led straight up to a hand that had expressively spread fingers. "It's sometimes hard to tell where research ends and business begins," he said. "The two overlap. But as it happens, I *was* going to file for registration next week because I wished to avoid this very error—the mistaken impression that we might be flaunting the regulations. I can assure you that it was never our intention to . . ."

"All right, all right," Malder said, brusquely. "We shall see."

Malder viewed Lidlun with assessing animosity. So. He was going to try and brazen it out, was he? A clever-dick. Well, we'll see about that. "Now, Mr. Lidlun, when did you first learn of Professor Svitsorren's work?"

In 126 Sutcling began his probing.

"Professor Svitsorren, you were working at the Institute of Psycho-Neurology. Why did you choose to leave this supervised position in order to work more secretively for Lidlun Enterprises?"

"I didn't choose," Svitsorren protested. "I was placed in an invidious position where I could not sensibly refuse the offer."

"Oh? Pressure was brought to bear upon you? You were coerced?"

"Yes. Well, in a way. It's . . ." Svitsorren looked hurt. "He heard of my work somehow and . . . and wanted to speed development. He

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had superior facilities and equipment and an unlimited budget, and . . ."

"Uhuh. He seduced you with the offer of an elegant brand-new laboratory, is that it? And you felt unable to resist."

"No, no, it wasn't like that. That wasn't the reason. No, you see, if I hadn't accepted he would have got someone else."

"Yes? There are others engaged and knowledgeable in your special research endeavor?"

"Uh, well, not quite as I was," Svitsorren admitted unhappily. "Mr. Lidlun let me understand that he gave me first option to the post because I was the pioneer. But he let me know that he could readily recruit other able persons who, with the possibility of a known object in view and generous finance, could quickly match and surpass my own efforts."

"Hm-m-m. You didn't want someone else to beat you to it, eh?"

"What? No. No, look, you don't understand. The point is, if it hadn't been me it would have been someone else. Working from the basis of my theories, Mr. Lidlun would have gone ahead with or without me."

"And you preferred to go ahead with him?" Sutcling insinuated.

"I had no choice. Can't you see that?" Svitsorren said. "Mr. Lidlun was determined. It was delicate work and others might not have been so careful. And by being present I would know the progress being made firsthand."

"Ah." Sutcling checked a paper on his desk. "Lidlun Enterprises also doubled your salary, supplied you with a home, and provided you with other fringe benefits. Yes. An attractive offer." Smirking, he sat back and waited.

"No, really," Svitsorren said, "That had nothing to do with it. I could do nothing else, you must see that? I couldn't let it get out of hand. It was my project. I felt responsible . . ."

"Quite so," Sutcling said condescendingly.

"Dr. Rosenflaut, it was through you that Lidlun learned of Professor Svitsorren's work, wasn't it?" The large blocky Rosenflaut was being interviewed by Leumworth.

"That's right," Rosenflaut said easily. "I heard about the professor's recordings and was interested. I thought discoveries in my own field might help to accelerate his program. I happened to discuss the matter with Hammond, ah . . . that is, Mr. Lidlun, and he was taken by the idea."

"And Lidlun approached Professor Svitsorren and persuaded him to the advantageousness of becoming a Lidlun employee?"

"You could say that. Svit was not exactly eager—he's a bit of an old woman in some ways—but precedence and scientific curiosity won him over. He's a good man."

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"So it would seem," Leumworth said stiffly. He sniffed. "What was your part in the affair? In what way did your talents figure? How was your 'field' connected to that of Professor Svitsorren?"

"Hold on," Rosenflaut said urbanely. "One at a time. There is no rush, is there?" He stretched his legs and settled farther into his seat. "Svits and I are technicians," he said amiably. "My line is electrophysics. When I learned of Svit's achievements I was naturally intrigued."

"What was his achievement exactly?"

"He discovered an electro chemical process for layer-locking minute impulses. With a very high degree of selectivity the tiny charges made fine-grain conversions in the sensing material and were precisely fixed by the proportion of the chemical change involved. It was like a plating process in a way, with each infinitesimal charge successively making its deposit."

"I see. And to what end had such a process been devised?"

"Initially to provide full-scale high-fidelity response-reproduction of cranial activity. It was meant as a vastly improved method of studying all-over cerebral reaction to stimuli. The sensing material, sequentially treated to reverse the pattern imposed, can be magnified to give significantly coherent visual evidence."

"Oh, can it?" Leumworth countered with primness. "It's use was not restricted to such observations though, was it?"

Rosenflaut smiled. "Well, no. Svit found that when these impulses were relayed to another brain they triggered some of the donor's mental pictures and response feelings in the recipient."

"You mean that it inspired a second party to emulate the thought processes of the first?"

"That is correct," Rosenflaut said. "Of course, it was primitive then and not practically applicable. But, in essence, it was, basically, a form of thought-machine . . ."

"Mr. Lidlun," the trenchant Malder said, "how well did Professor Svitsorren co-operate with you?"

"The prof and I got along quite well," Lidlun declared. "Mind you, he did have a tendency to raise objections from time to time. But this was all to the good. Despite what you may hear to the contrary, men in my position have no great time for yes-men."

"Objections? What kind of objections?"

"Oh, well, you know. He's the careful type. Just as well. We took the utmost precautions that volunteers took minimal risks," Lidlun said piously. "The prof saw to that."

"Oh. And what happened to these volunteers? Did any of them become deranged?"

"Uh, well, not *deranged* exactly,"

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Lidlun said. "We *did* make one minor miscalculation with one of the earlier subjects . . ."

"The receptor was refined to be contained in a slim oval envelope," Professor Svitsorren told Sutcling. "This was inserted under the scalp and was virtually indetectable."

"When did you first try to transfer the data taken from one mind into another?" Sutcling asked.

Svitsorren wriggled. "I . . . we weren't . . . really ready for it. It was still largely theory, you understand? But Mr. Lidlun . . . well, he *obtained a . . . a volunteer to be* a . . . a receiver. Dr. Rosenflaut had calculated . . ."

"Wait, wait. Who was the volunteer? A staff member?"

"Er, well, no." Svitsorren felt hot and uncomfortable. "Er, he, ah . . . Mr. Lidlun . . . procured his services, ah . . . paid him well. He, ah . . . was quite amenable . . . signed a waiver and, ah . . . so forth. We had processed the envelope of a staff member who had returned from a two weeks vacation, and . . ."

"Wait, wait now," Sutcling insisted, nose twitching. "Who was the volunteer, this . . . this man obtained by Lidlun? Where did he come from? And did he truly submit freely and in full knowledge of the nature of the experiment?"

"Uh, did he. . . ?"

"Yes, did he?"

"Oh." Svitsorren dabbed at his dampness. "I did not really approve, you understand. I . . . I don't know where Mr. Lidlun found him. He . . . I thought he was a hobo."

"Ah. And was he drunk?"

"Er, no. No, I don't think so. Only partly . . ."

"And what went wrong?"

"Ah, well," Svitsorren's hands were slippery to each other, "we, that is, it was Dr. Rosenflaut's idea, uh . . . we, uh, connected him to the output and, ah, increased the rate of his mental activity and, ah . . . fed him the two weeks of impressions."

"I see. And how long did that take?"

Svitsorren coughed. "Uh, about, uh . . . twelve minutes."

"Twelve minutes?" Sutcling was startled. "Good heavens! And what was his reaction?"

Svitsorren blushed at the memory. "Total amnesia," he said simply.

"What we did wrong," Rosenflaut explained to Leumworth affably, "Was to speed his mind in order to absorb rapid intake. I worked it out afterwards. We had done it the wrong way around. What we should have done was to slow his mind down, practically to nonfunction, and *then* have whacked the information into his mind as fast as possible."

"I, er, don't quite follow your reasoning," Leumworth said. He

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was an over-wary man and was more than a little put out by Rosenflaut's casually informal manner. "I cannot see how you expected a mind to absorb a plethora of stimulation in so short a time. That is, not to any intelligent comprehensible degree."

"Wrong," Rosenflaut replied cheerfully. "The mind is as flexible as time itself. Certain excitatory drugs can make even the slowest of motions appear rapid. Likewise, inhibitory drugs stretch time so that, to the taker, seconds are retarded to seeming abnormal length. The simple natural example of the ability of the brain to slow time is during stress. To a man falling from a high building, for instance, the second elongates fantastically. His mind crowds with information of both major and minor importance. This 'quick thinking' can easily be seen as a fundamental survival mechanism."

"Maybe so," Leumworth answered, sighting disapprobation past his nostrils, "but there must be an upper limit to how much can be crowded into a brain at any one time."

"Wrong again," the supine Rosenflaut said. "In the case of our treatment you must remember that at no matter what pace the information is delivered, it comes in the sequence in which it was first emitted, with the same associations, conceptions and cognizance. That is to say, if the donor spends a lazy afternoon on the beach, the sequence of this pattern will repeat as a consciousness of a lazy afternoon on the beach, *at no matter what speed the sequence is delivered.* Do you follow me?"

"I, er . . ." Leumworth sat up even straighter. "It's a kind of memory then? A transfer of memory?"

"You could say that. After all, that's what life is, isn't it? Really nothing but a memory."

"Um-m-m." It was a grudging concession. "You experimented further?"

"Yes, of course. We altered the technique radically. We reduced his mental activity to the pace of an arthritic snail on a ball-and-chain and, with his mind a virtual blank page to write on, we introduced the information in a burst that lasted a little over nine hundred and fifty thousand microseconds."

Leumworth was incredulous. "It couldn't possibly have been successful!"

"But it was," Rosenflaut assured him blandly. "One hundred percent." We gave him the memory of another man."

Leumworth was reluctant to believe it. "Who was the person that you gave this . . . this memory to?"

The sprawled Rosenflaut unlaced his fingers to measure fish. "To the man who had lost his memory, who else?"

"He thought he *was* Punter," Lidlun said. He brushed ash from

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his knee and swirled his legs recrossing them the other way. He sounded peeved. "He thought that he had just come back from his vacation and that we had just removed the recording pad."

"He had no idea who he really was?"

"No. Mind you, he'd lost his mind completely in the first test." Lidlun paused. "And, incidentally, that technique could be useful too, indoctrinationwise." He quizzed Malder hopefully but met unchanging bleakness. "Hm-m-m. It made him a vegetable," Lidlun went on. "He even forgot how to talk. Made him perfect as a receiver."

"But it was not his own memory, was it?" Malder criticized.

"Maybe not, but any memory is better than no memory at all. Isn't it? He was lucky to get one at all." Lidlun drew on his cigar. "Fact is he proved to be quite a nuisance. He wanted to get back to work again. Fine fix. We couldn't have two junior techs running around the works both thinking they were the same man. And, of course, he didn't look like Punter, even to himself. So we kept him in wraps, explained his physical change as an unexpected side effect of the process, and packed him off on a three-week cruise by way of compensation."

"He believed all that?"

"Ben made it sound convincing."

"But, man, did you make no effort to help him recover his own identity?" Malder was shocked. "You couldn't let him go on indefinitely thinking himself to be another man."

"Be reasonable," Lidlun said, a trifle irritably. "We couldn't give him a memory that we didn't have, and the erasure left him none of his own memory to recover. As Ben said, he'd be influenced by his memory but he'd still really be him, and he'd behave as himself as a separate person from recovery point onwards."

"But how could he behave as himself if he thought he was someone else?" Malder contended. "What about his own family and friends and responsibilities?"

Lidlun sighed. "Believe me, if we could have given him his own memory back we would have. He was forever writing letters to his mother and his fiancée. We had a secretary go with him everywhere he went, and she sidetracked him as much as possible and re-directed his mail. This had to be answered by *my* secretary, who filled in as mother and girl friend."

"Hardly a satisfactory solution," Malder frowned.

"You can say that again," Lidlun agreed. "He came back from one vacation and went straight off on another. He was a bum." Lidlun circled his cigar. "Don't tell me that bums can't be rehabilitated. This one was. He was having the greatest time in the world and didn't even know it. Like I said, the process we developed at Lidlun Enterprises has

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a lot of therapeutic applications . . ."

"Despite these results you still went ahead?" Sutcling said, looking askance at Professor Svitsorren. "You went on experimenting with scant restraint?"

Svitsorren's hands waved agitatedly. "It was not *my* wish," he said. "I . . . I advised Mr. Lidlun of the unwisdom of continuing in that particular direction but . . . well, he . . . he told me how committed we were. How far we had gone. What . . . How deeply his firm was relying upon this project . . ."

"The old sob story. And you believed it?"

"I . . . It was true. He showed me statements. I'm . . . I'm a scientist, not a businessman, and the costs, well . . . they were enormous. I had no idea . . . It was not my worry, he said, but his. I handled my side of it, he said, and he handled his. But . . . the firm was in debt. He'd borrowed a great deal to keep going . . ."

"And at this vital stage you felt obliged not to let him down?" Sutcling said cynically.

"Well no, I couldn't. After all he'd put into it, the backing he'd struggled to raise . . . Anything I asked for he obtained. The money side was not my concern, he said. I was not to bother my head but, well . . . I just couldn't ignore the implications of cessation in effort. I felt . . ."

"Responsible?" Sutcling said.

Svitsorren tacked. "Undoubtedly there is a great future for our process," he defended. "In . . . As an aid in correcting mental health. In . . . in education. Numerous uses," he ended, sweating. "Numerous *beneficial* uses."

"I'm sure," Sutcling said with a sardonically lifted eyebrow. "The sale of the experience for its own sake was just a profitable sideline. . . ."

Rosenflaut balanced a heel on a toe. "I could see no great harm in it," he said. "We could give the impression of a novel two-week vacation to anybody. Who better to offer it to than older persons? To an old person on his last legs such an experience would be a very real and satisfying pleasure, an extension of his life, an impression of being rejuvenated for a week or two."

"Yes? And afterwards?" Leumworth queried acidly. "The lingering effects seem to indicate an inability to recover self-identity, and there is a confusing phase where subjects have great difficulty in re-establishing their consciousness of their true self."

"It largely wears off in a few days," Rosenflaut said airily. "Couple of weeks at most. Of course, they never entirely forget their additional memory. It becomes a part of their lives just like any other experience. A bonus part."

"A bonus two weeks," Leum-

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worth said with a faint sneer, "that they take a month to recover from."

"It's a lot more than two weeks bonus really," Rosenflaut replied, seriousness underlying his geniality. "It's a lifetime. In two weeks a man might experience an actual vacation, but during this time his thoughts will range far and wide in associations with various aspects of his life, right back to his childhood. And also will include his sleep-time and dreaming."

"And this is what makes the fixation so striking?"

"Precisely. The transfer includes everything, right down to the last seemingly trivial detail. Continuing on from the old memory, the new one is later, fresher, and in many ways complete. And, in the case of receptive older persons, much more lively and desirable."

"And you see nothing wrong with inflicting this disruptive force upon the minds of the elderly?"

"Not really," Rosenflaut said tranquilly. "The way I see it, they have very little to lose and everything to gain."

"I see." Leumworth's lips thinned. "A pleasure trip. Too good to be made generally available to the poor, so your experiments moved up to invite wealthy paying 'volunteers'."

"It seemed the sensible way," the placid Rosenflaut said. "We didn't want any squabbling and there are far fewer elderly people who are rich. And it helped us to pay our way. All in all it seemed to be an arrangement that made everybody happy."

"Hm-m-m!" Leumworth said.

Malder was aggravated. "Without consulting this or any other department you started in obtaining patterns that you could dispense commercially, regardless of what the full consequences might be?"

"I wouldn't say that," Lidlun said, viewing what was left of his stogie and deciding that to smoke it further would create an unwelcome image of less-than-affluence. "No." He reached forward and dropped the generous butt into an ashtray. "Our reason for applying to the elderly or incapacitated rich was merely fund-raising, the receipts being donations to assist our work and to help defray expenses."

"Oh-ah. The treatment given was just a token of appreciation I suppose?"

"Right," Lidlun concurred, unconscious of jibe and seeming pleased that Malder had so clear a picture of the situation.

"Did your, ah . . . 'customers' have any idea what they were letting themselves in for?" Malder said ominously.

"Why, er, ah . . . yes," Lidlun said. "Not initially, of course. But we've had no complaints from, ah, takers, and indeed, a couple have returned for repeats . . ."

Sutcling said, "Professor Svitsor-

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ren, what in your opinion was the quality of the donated memories?"

Svitsorren did not like the question. "I . . . Well, one memory is very much like another. It's very hard to tell. Everybody's different. It is very hard to determine beforehand the, ah, precise quality of the donor."

"Meaning that such persons could be mentally unbalanced or otherwise undesirable?"

"They . . . We screened them, of course." Svitsorren squirmed. "No, ah, extreme elements, ah . . ." He mopped. "Just . . . Just interesting people . . ."

"Such as?" Sutcling requested with polite irony. "Could you list these 'interesting' donors for me? The first was Punter, wasn't it? Did you use him again? Commercially I mean."

"Commercially? Punter? Oh no," Svitsorren said, "not Punter. Punter Two carried a recorder every time he went off on vacations, but they were never used."

"What ones *were* used?" Sutcling was determined to gouge the demeaning facts from this nervous man. "Whose was the first memory to be put on the market?"

"Whose?" Svitsorren's dry tongue dragged on dry lips. "Uh, well, the first, I suppose, was Bransard Rutger . . . you know, the . . . the young film star . . ."

"We overdid Rutger a bit," Rosenflaut confessed. "At the time we were unaware of donor-sensitivity to closely repeated playbacks. He was popular though."

"So it would appear," Leumworth said without warmth. He checked his notes. "You seem to have supplied a number of older persons with the, ah, Rutger pattern. Some with a number of instantaneous repeats."

"Hm-m-m, yes. The same two weeks over and over. As I said, it was popular and seemed reasonably safe. You see, Rutger is a young up-and-comer and we fitted him with a recorder the day before he married Mianda Delitely."

"How much was he paid?"

"Uh? Oh, you'll have to ask Hammond that. He took care of the, ah, donor side of it . . ."

"You know you have ruined Rutger's life, don't you?" Malder asserted bluntly. "He had a great future awaiting him in movies before you misapplied his pattern with excessive extravagant use."

"It was totally inadvertent I can assure you," Lidlun said calmly. "We had no idea that there was a linking residual effect with the donor. This is something we expect to investigate further. It should be of great interest to ESP researchers . . ."

"Hah!" Malder flipped down a flap in his desk and hauled a tape recorder forward on its runners. It was preset. He depressed a key. "Listen to this."

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The tape unwound. Crackle. Sputter. ". . . And so I said no. I keep getting these shooting pains in my head. Shooting pains. Quick, see? Like a stab. Seems like nothing. Comes and goes. Jab and it's gone. Hardly notice it. Shooting pain, see? In my head. Right there. Flash. And then . . . Who are you? Don't I know you? Yeah, I know you. Yeah. Where am I? Say, I want to tell you something. Uh. Now see here, I get these . . . I'm on the lot, see? And . . . Ah . . . I never floated in my life. But I'm floating like I ain't there. And then the nurse comes . . . or the butler. But he ain't a real butler. He ain't in the script. And nothing feels like anything and . . . and . . . Marv? What are we doing here? Marv, you tell 'em. About the shooting pains. About the . . . About the . . . Marv, there's something funny. Everything was O.K. Everything was O.K. till . . . Was everything O.K. when till, Marv? I've got to . . . Say, I like your tie, Marv. Where . . . It's one of the crummiest sets, Marv. You're my agent, you should . . . It's like a stab all over. Don't notice it. Funny kinda thing. She shouldn't do that to me. What have I done? Marv . . . No thanks, I don't smoke. Do I? No. I don't think . . . Say, what is this place . . ."

Malder switched off. "Recognize the voice?"

"Bransard Rutger," Lidlun said without hesitation. "As I said, it was an unknown factor. We've been more careful since then to ration . . ."

"But his life, man!" Malder cried. "His career! His marriage!"

"He is getting the best attention, isn't he? I've accepted the responsibility and Lidlun Enterprises is footing the resthome bills. They tell me he is making great improvement."

"But, do you think that's all there is to it?"

Lidlun was mildly surprised at his emotion. "What's done is done. We undo it as best we can. We can't do more. It's fate. These things happen. He could just have . . . well been knocked silly by a tipped-over floodlight."

Malder was outraged by such seeming insouciance. "You just cannot employ such a discovery to suit your own ends with complete disregard to its many and varied ramifications. You just cannot sell such an experience and dissociate yourself from the result that it has upon the individual, and through the individual, upon society!"

"Experience is experience," Lidlun pronounced. "We are influenced by every experience we have, great or small, all the time."

"Yes, but"—Malder searched for words—"this is a direct interference with personal lives, a direct alteration and insertion into the mental processes."

"I agree," Lidlun said, "to a degree. It is an addition. Apart from

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its promising therapeutic value, our discovery will help to promote greater understanding between people . . ."

"Not the usual type to offer their services to a scientific cause, don't you think?" Sutcling posed.

Svitsorren, badgered, said, "We had the quite natural desire to obtain recordings of some diversity."

"Naturally," Sutcling goaded. He looked at his list. "Among others—a seedy socialite, a so-called big-game hunter on a short safari, a stunt motorcyclist, a second-grade racing driver, a suspected jewel thief, and a woman of doubtful virtue. All, I am sure, very diverse."

"It was research," Svitsorren said desperately. "A . . . A testing for the most suitable, ah . . . reaction . . ."

"At five thousand dollars a 'treatment' it showed a nice fat return of one hundred percent on every buyer after the first," Sutcling said bitingly. "You have allowed your discovery to be unashamedly exploited primarily for personal gain with no thought for the human distress it may cause upon the way."

"It was the circumstances," Svitsorren pleaded. "And these records haven't been used yet . . . Well, only once or twice. They'll soon be back to normal with no serious effects."

"Only once or twice?" Sutcling scoffed. He leafed over a page and his finger searched for a total. "Once or twice indeed! There's over a hundred cases here that have been brought to our notice. Lord knows how many others there may be that we have no knowledge of."

The number staggered Svitsorren. He stared at Sutcling, horrified.

"She did divorce him then?" Rosenflaut said.

"Didn't you know?" Leumworth challenged him.

The relaxed Rosenflaut flapped a hand. "No. Quick, these movie stars, aren't they?"

"Her grounds were Bransard Rutger's insanity."

"Ah. Convenient. Tough luck on the boy, but it won't be long before he's fully recovered." Rosenflaut was confident.

"I'm glad you think so," Leumworth remarked tartly. "But he's only one. What about the rest?"

"The rest?"

"Yes, the rest. Take Rutger's case alone. You know, of course, that your first Rutger 'patient', Clostus X. Pyrus, was so obsessed with the idea that he was Rutger that he pestered Mianda Delitely into a 'repeat' marriage and a 'return' to their honeymoon in Acapulco."

"Well, I did hear some such rumor," Rosenflaut nodded.

"It was no rumor," Leumworth stated flatly, "it was fact. And it was ridiculous. The old Greek could hardly walk, yet he was crazy

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enough to try and behave like a young man."

Rosenflaut rubbed his nose. "You'd think he'd have had more sense, wouldn't you?"

"Sheer irresponsibility!" Leumworth snapped.

"We didn't know then how it affected Rutger," Rosenflaut excused himself. "At the time, one or a dozen, it seemed to make little difference. Synchronize, press the button, two weeks vacation. Simple."

"How you can . . . can loll there untroubled by conscience I just cannot conceive."

"What's wrong?" Rosenflaut asked. "I'm sure Rutger will be better shortly. And the old shipping tycoon is not unhappy, is he?"

"I wouldn't know," Leumworth said coldly. "Two days after she married him, Mianda Delitely became a very rich widow."

"You see, Mr. Lidlun," Malder said tightly, "your machinations and manipulations have had consequences far beyond the realm of experimentation in a new form of entertainment."

"It is not as entertainment that the discovery can best be used by mankind," Lidlun said adroitly, not at all abashed. "At first, yes, our aim was to bring a touch of spring again to the aged and infirm, to alleviate the dispirit of their declining years. However, many other worthy aspects are now envisaged."

"Such as?" Malder said icily.

"Uh, well, in education. Languages, maths, music, could all be given, supplied by donor teachers, a solid framework of a lifetime's knowledge."

"Plus a great chunk of the teacher's private life. Would he like that do you think?"

"Er, under careful control," Lidlun submitted, and skated on. "A help towards racial understanding, cross-experiencing to greater fellow-feeling. That is the key—promoting greater understanding."

"You don't think that this might encourage greater dissatisfaction and antagonism in the lessee when he re-orients himself again to himself?" Malder said, silkily deadly.

"Then again," Lidlun went on, ignoring the overtones, "it could be used in psychiatry, that a psychiatrist might actually experience a patient's malady . . ."

"And go crazy?"

". . . Or be used in crime prevention, enabling law officers to learn exactly what and how a miscreant thinks."

"As with Robertson of Central I. and E.? He's so confused that he thinks he *is* the foreign agent. Under drugs he paradoxically remains know-nothing Robertson, fully sensible he refuses to divulge what he knows. His own friends have to resort to putting him through an old-fashioned third degree."

Lidlun looked baffled. "Robertson? Who's Robertson?"

"Never mind," Malder said, ex-

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asperated. "He's the least of your troubles. It was no good you dismissing the writs that have been brought against you. Those are just a start. Through your blasé indifference there's a proper legal tangle lying ahead."

"Writs? What writs? What legal tangle?"

"Oh, come, come," Malder said loftily, "let's not play games. There's the heirs to Mianda Delitely's late last three husbands to start with. And then the death of another old codger who lost a duel with her present spouse can be directly attributed to Lidlun Enterprises. The Mitzenphiefers, the Berberry-Joneses, the Kunsle-Swensens—inumerable families have been dismayed and embarrassed by the memory plants you have persuaded some of their older members to accept. Grandfathers are disinheriting their own and chasing willfully all over the country, mostly after strange women that they suddenly 'know'. Some have taken to stealing and other even worse improprieties. And there's one old fool who risks the life and limb of everybody by insisting upon being lifted from his wheelchair onto a motorcycle—which he rides recklessly to the terror of the whole neighborhood."

"Hold on, hold on," Lidlun said, genuinely amazed. "What are you talking about? These things have nothing to do with me. The Mianda Delitely affair maybe, well, yes, but as for the rest . . . You must be mistaken." His face reflected guileless honesty. "We would never have permitted the new records to be used before getting a clearance from the QUOD."

Nevertheless, it was a trifle odd, Lidlun thought. He pondered. The preparations? He *had* intended to execute a compact remunerative foray prior to making a strategic retreat. He thought with brief nostalgia of Brazil and the beginnings of a Swiss account that he had arranged for.

Malder got his breath back. "What?" He popeyed the dapper little man. "Don't tell me that you are going to deny knowledge of your own direct transactions! Checking over the last three weeks we've found that you personally have been depositing large sums of money into a foreign bank. Don't try and tell me you signed it away without being fully aware of its source!"

Lidlun was hit. "Foreign bank? The last three weeks?" He wore a stunned look. For a moment it seemed as though he didn't know whether to laugh or cry. It couldn't be. For a while his mind scrambled. And then he remembered something.

"Tell me," Lidlun asked Malder, "what's the date today?"

"I don't care!" Malder roared. "Bring him up here!" Savagely he slammed the phone back onto its

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cradle and turned back to glare at his dissembling guest.

Lidlun smiled back, diffidently.

They brought Svitsorren into Room D. Lidlun was standing. He and Svitsorren gazed at each other.

"Well?" Malder barked. "He's Professor Svitsorren, isn't he?"

"Uh? Who him? Don't be silly. With the dyed hair he is a bit like the prof, but that's Elwood—Elwood Cansey, our truck driver."

Svitsorren gawped.

Malder took two strides and gripped him by the shoulder. He swung to jab a finger at Lidlun. "And who," he demanded of the pseudo Svitsorren, "is he?"

"Him?" The elected Svitsorren fingered a lip in bewilderment. "Why, he's Bo Jeaksy, our janitor."

Malder's muscles bunched. His starting eyes stabbed first at one and then at the other. His teeth began to powder under pressure. "Dummies!" he hissed. "We've been taken!"

At that moment the door opened and Rosenflaut was brought in. He noted the company and wryly smiled. "'Lo Elwood, Bo. So you're the ones been cheating on us to the QUOD boys, eh?"

"Ha-ha," the Lidlun one said, and started to chuckle for real.

"Well?" Malder grated. "Who is this one?"

"That?" the Svitsorren said, comprehension now bringing a grateful and unexpected relief. "That's Bunk, the guy who collects our garbage." He giggled. "His name's Doylavitch or something, but he's called Bunk," the giggling was getting the better of him, "because *he-he-he-he-he-he* lies *ah-ha-ha-ha-ha*-around a lot. *He-he-he* . . ." He went into a fit of mirth.

The good humor was contagious. In Rosenflaut's clothes, copying Rosenflaut's manner, old Bunk even looked a bit like Rosenflaut. The incongruity was inexpressibly tickling. Then Lidlun guffawed.

The Rosenflaut substitute looked from one to the other, perplexed. Then he caught on and the merriment reached him. He joined in, doubtfully at first, in short runs, but soon crowing with increasing enjoyment.

Laughter filled the room, rising helplessly to be virtually delirious. The three replacements hung onto each other for support and rumbled, snickered, brayed, cried achingly for mercy and stamped their feet, and tearfully implored their hosts not to make such excruciatingly hilarious faces.

The QUOD men could only watch with volcanically stony impotency. Malder boiled. He and his team were definitely not amused.

Ah, but it is hard even for clever rogues to beat authority. Six months later . . .

From his suite in the Rio de Janeiro Hilton Lidlun gazed out at the Sugar Loaf Mountain.

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"It's a dirty trick, Ben. Ben? It's spite. Just running them for nothing. We know the pitfalls now. Packed eight-hour day—who will that disturb? Where's Svit? Just when we're ready to go. Who does this Collins think he is? Go back voluntarily, huh! Is that you, Ben? Short and sweet and not enough to cause prolonged identity error. Punter Two can handle . . . Hey, Ben, this floating sensation, do you . . .? It has undeniable therapeutic benefit, greater understanding . . . We should have taken time to pick up our records, Ben. They . . . These shooting pains, it's not . . . Great view, isn't it? Where did Svit go? Ben? It's not fair, Ben. They shouldn't . . ." ■

IN TIMES TO COME

Next month we're starting a two-part novel by James H. Schmitz that will, in later years, be recognized as another classic to match his "Witches of Karres"—but of a totally different type.

"The Tuvela" presents—for about seven-eighths of its text—a completely one-sided viewpoint. It's the story of one young woman, trapped on an island where the invading alien Parahuans are preparing to take over the planet, her only allies three mutated and intelligent otters.

The story is laid in Schmitz's favorite background—the Culture of The Hub. You've met the girl before—Dr. Nile Etland in "Trouble Tide." And her problem is to stay alive long enough to get a message away from the island to the rest of the population of Nandy-Cline and the warships of the Federation.

She's alone, hunted down by the invading Parahuans—but she's not exactly helpless.

As I say, the first seven-eighths is an entirely one-sided view of the situation.

Do you happen to know the good Dr. Dodgson's definition of a "boojum?"

The Parahuans didn't; the term they invented was "Tuvela."

Also coming up next time is an informative and amusing article titled "Steamer Time," by Wallace West. When I asked West to write up something on the Morse Report on Air Pollution and what could be done about automobile exhaust—which had come to the conclusion that the most workable answer was a steam car—I didn't know that West was, himself, a steam-car buff, and ex-Stanley Steamer owner.

I think you'll enjoy his anecdotes, as well as his facts!

THE EDITOR

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HOW THE SOVIETS DID IT IN SPACE

Mr. Stine spent some time digging through Czech and other European and Iron Curtain nation press files gathering data on this article. The material is not secret—but this is the first unified compilation we know of.

G. Harry Stine

NOTE

The author began collecting historical data on astronautics in 1950 and currently has one of the largest private collections of astro-history in the country. He is a consultant to the Astronautics Department, National Air & Space Museum, Smithsonian Institution, and a member of the Technical Committee on the History of Aeronautics and Astronautics of the AIAA. He is also Chairman of the Rocketry Subcommittee of the Federation Aeronautique Internationale. This article is the result of patient collection, analysis, and synthesis of published information. Opinions, where expressed, and analysis are the total responsibility of the author and do not necessarily reflect the opinions and conclusions of any organization with whom he may be associated.

The Great Soviet Space Guessing Game is now over.

On May 26, 1967, the Soviet Union unveiled its Vostok carrier rocket for the Paris Air Show at le Bourget. And ten years of guessing on the part of Western rocket engineers and space watchers came to an end. For the Soviets not only revealed their manned spacecraft launch vehicle, but also the details of the liquid propellant rocket engines that powered it.

The Soviets had previously displayed the Vostok spacecraft in Paris, Moscow, and Montreal, and had provided tantalizing glimpses of their space program by revealing on display various unmanned spacecraft starting in 1961. Their Tass news agency releases following each space spectacular were scrupulously correct and truthful (we now know

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this), but were "the truth and nothing but the truth" without including "all of the truth." Said Tass releases were maddening because of the information they did *not* provide. The same held true of the data the Soviets supplied to the Federation Aeronautique Internationale in Paris to substantiate their claims for world records in astronautics; these documents gave all of the necessary data for claiming the records, but the criteria of "necessary data" was established by the FAI on the basis of Soviet proposals many years ago!

However, following the Paris unveiling of the Vostok launch vehicle, the trickle of information coming out of the Soviet Union has turned into a veritable flood in 1968 by comparison to past years.

On January 15, 1968, Sovfoto released to *Space Business Daily* in Washington a photograph of the launching of the "standard space carrier rocket" from the Tyuratam Cosmodrome east of the Aral Sea. This was the same booster rocket that was shown in Paris as the Vostok launcher, and the caption read, "launching of the Soviet pioneer manmade earth satellite."[1] Although this was interpreted in the United States as the launching of Sputnik-I, later information indicated it was probably the launching of Lunik-I. Another Sovfoto released to *Space Business Daily* on February 16, 1968 showed the Sputnik-I launcher[2] . . . and it was the same booster rocket, slightly different upper end configuration, as we will see.

This was the final evidence that the Soviets had used the same basic launch vehicle—"carrier rocket" in their terminology—for nearly all of their space launches during the first decade of the Space Age. We are now able to put together from the accumulated information a consistent story of how the Soviets did it in space.

First of all, it must be pointed out that the Soviet space program was not and is not German in origin and accomplishment. That persistent rumor, now nearly dead, needs to be given the *coup de grace* forever.

The Soviet space accomplishments are the result of a long-term program characterized by careful planning, consistent long-term funding, logical progression, and extremely pragmatic engineering. The legacy of the Russian schoolteacher, Konstantin Edouwardovitch Tsiolkovski, has been carried forward from his original work of 1903 in which he laid the theoretical and mathematical foundations for rocket flight in space, including the concepts of staged rockets. In 1919, the Soviets established the world's first rocket research laboratory, the Gas Dynamics Laboratory in Leningrad (LENGIRD). This was later followed by a similar laboratory in Moscow (MOS-

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GIRD). Today's Soviet space planners, designers, and chief engineers got their start in GIRD, some of them long before Dr. Robert H. Goddard flew the first liquid propellant rocket in the United States in 1926. Sergei Pavlovich Korolev, the designer of the carrier rocket, the sputniks, the Vostoks, and the Voskhods who died in 1966, began his career with LENGIRD in the early 1930s.[3]

And, in the 1930s, the Soviets were flying their own liquid-propellant sounding rockets such as the GIRD-X. They ran the first experiments with rocket-assisted-takeoff of aircraft in 1934-1935 using a Tupolev I-4 fitted with six solid propellant rockets. In 1942, they were experimenting with three different rocket-propelled fight planes, the Tikhonravov 302, the Polikarpov *Ma'yutka,* and the Berezniak-Isaev BI-1. Rocket-powered flights were made with the BI-1 on May 15, 1942.[4] Contrary to some western historians, the Soviets did develop the RS-132 (M-13) "Katyusha" barrage rocket which could hurl a 21.8-pound payload to a range of 5.2 miles[5] . . . and the Red Army used a lot of them.

The collapse of Nazi Germany in 1945 brought a windfall to the Soviet Union just as it did to the United States. The Soviets captured Peenemunde (what was left of it) and the German A4 (V-2) assembly plant, the Mittelwerk, near Nordhausen (what was left of it after the American Army got through stripping it). The United States got the German rocket design and development team headed by von Braun; the Soviets got a couple hundred German A4 production and test engineers.

The Soviets pumped the Germans dry and were sending them back to Germany by 1949.[6,7]

They cranked-up the A4 assembly line again and began launching A4s, new ones. They built an improved version called the A-1 which they used as a sounding rocket; an example of this vehicle is now on display in Moscow. The Soviet engineers learned what they could from the Germans and simply integrated it into their own indigenous programs. Their space hardware as displayed in Paris in 1967 shows less historical derivation from Peenemunde than the U.S. hardware whose development *can* be traced directly to the German work!

But the Soviets had their sights set on bigger vehicles than the A4. Stalin called a conference on rockets in the Kremlin following V-E

On display in Moscow, Soviet space launch vehicles. In foreground, Soviet A-1, improved version of German A4 (V-2) with instrumented nose and two side-mounted instrument pods. In background, later small Soviet satellite launch vehicle, claimed by Gagarin to have launched Sputnik-I. (CTK photo)

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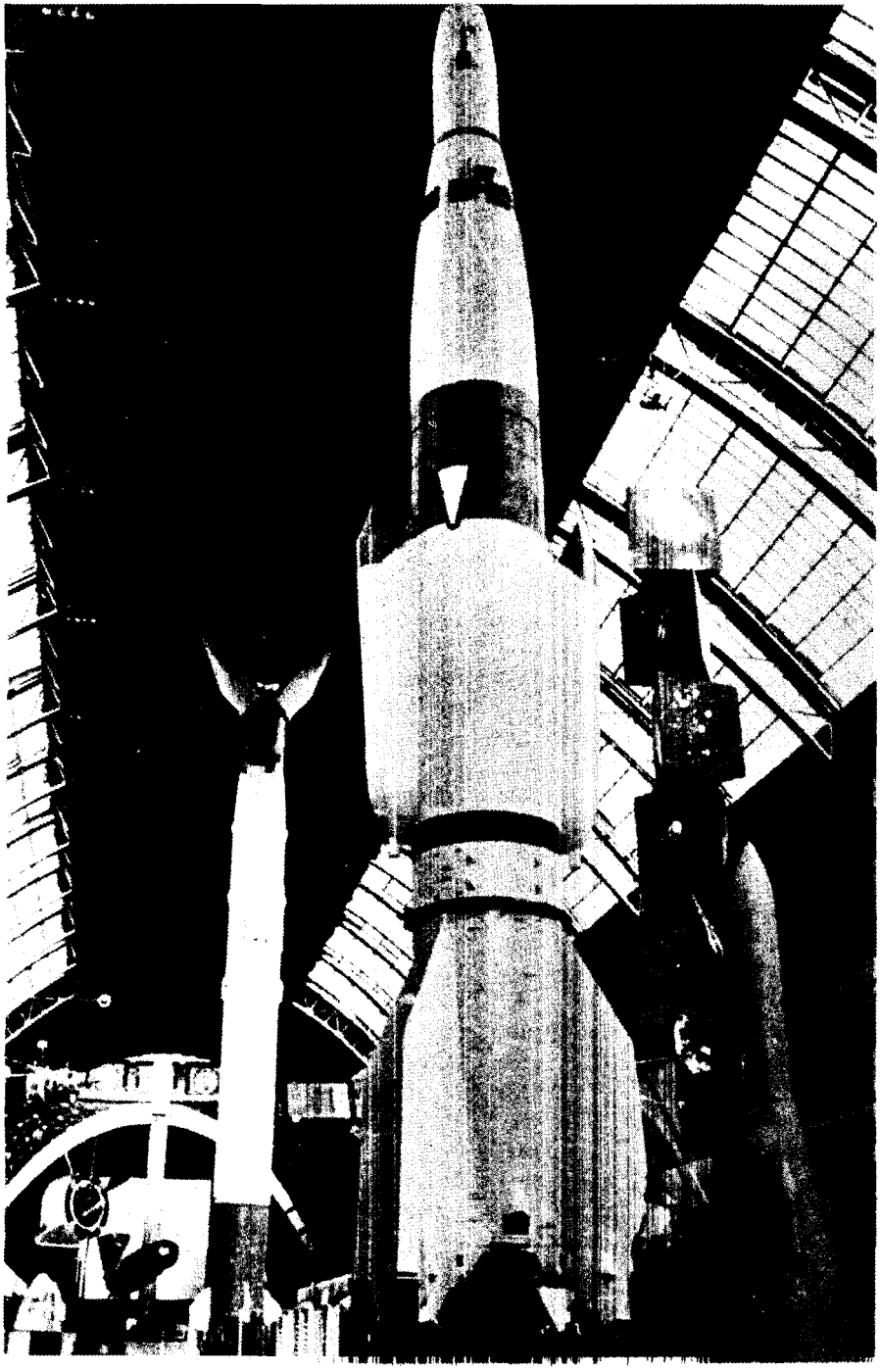

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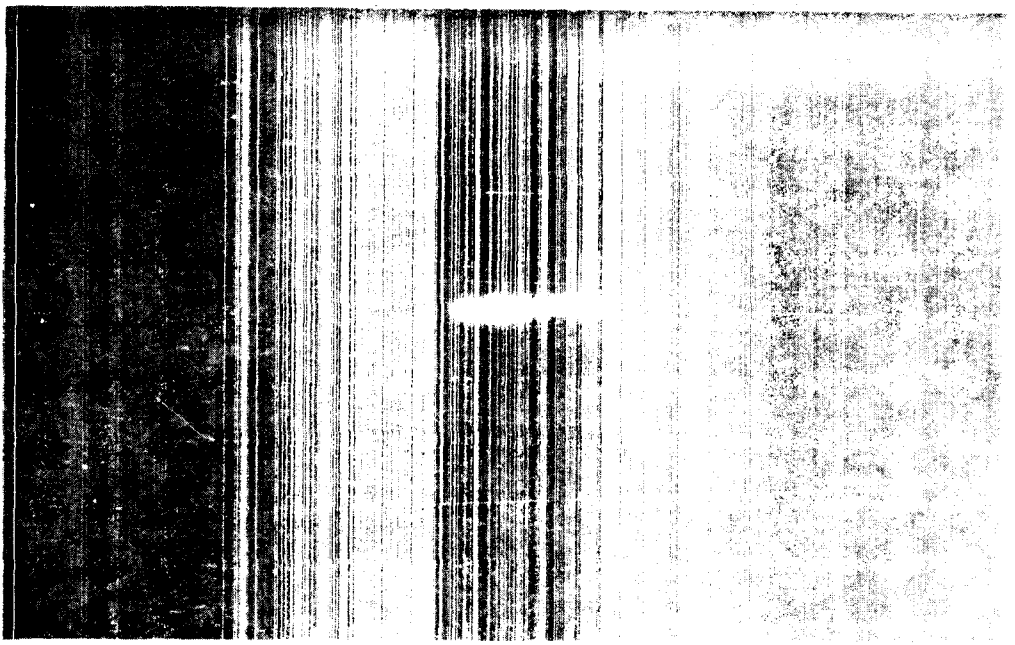

Sputnik II photographed December 21, 1957 from Air Force Missile Test Center, Florida using 24-inch tracking telescope with 500-inch focal length on 70 mm. f/m. "Hammerhead" configuration of sustainer core clearly visible, although satellite was 135 miles up and about 200 miles from camera. (U.S.A.F. photo)

Day, and it was Malenkov who cut short a discussion about the A4 with the statement that the range was too short, adding: "Do you think we're going to fight Poland?"[8] The Soviet ICBM program was started early. The high priority accorded Soviet ICBM and large rocket development during the late 1940s is reflected in the reported statement of Stalin in 1947 who stated that an ICBM "would make it easier to talk with the gentleman-shopkeeper, Harry Truman, and keep him pinned down where we want him."[9]

The United States' ICBM program was also started . . . then canceled on July 1, 1947. Design studies were continued at a very low level of activity. The nuclear warheads of the time were very large and very heavy. When they were finally achieved in the U.S., thermonuclear warheads were even bigger and heavier. Therefore, the U.S. opted not to build the very big rocket required to deliver such a payload over a 5,500 nautical-mile range. But Convair (now General Dynamics/Astronautics) continued design studies, coming up with a monster 180 feet long and 14 feet in diameter. Their 1953 design was for an Atlas missile 108 feet long

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and 12 feet in diameter; liftoff thrust was to have been 656,900 pounds from a cluster of five thrust chambers.[10] Note those figures.

The Soviets did not wait for the "thermonuclear breakthrough" of 1954 that permitted the size and weight of a TN warhead to be reduced. They went ahead to design and build the kind of big rocket it would take to deliver a heavy warhead over intercontinental ranges. In the process, they also built themselves a space launch vehicle with prodigous weight-lifting capabilities, and they did it in a very simple, straightforward way.

To propel a very large and heavy rocket, you need a high-thrust rocket propulsion system. As early as 1953, rocket engineers in the United States began speculating on some of the rumors of the development of large Soviet liquid propellant rocket engines, and it was believed that the Soviets had developed a large single-chamber, turbo-pump-driven rocket engine of 268,000 pounds of thrust called the K-103 based on the German A4 engine.[11] This certainly seemed to make a good deal of technical sense, particularly when the Soviet FAI data filed after the Vostok flights clearly stated that the launch vehicle was powered by six rocket engines. Some U.S. buffs on Soviet rocketry, including Donald J. Ritchie, correctly assumed that the Soviet ICBM used a cluster of these engines operating in a 1½-stage or "parallel stage" fashion for high liftoff thrust similar to the SM-65 Atlas.[12]

But most of us in the United States who were trying to analyze Soviet rocketry were trapped by terminology.

In the United States, a rocket engine is normally considered to be a single combustion chamber with a single turbo-pump for propellant feed. There have been exceptions tc this—the RMI 6,000-C4 (XLR-11) four-chambered engine that powered the X-1 series, the MX-774 and the early X-15, for example, as well as more current engines powering the Atlas, Titan, et cetera.

But, to Soviet engineers, a rocket engine can be any combination of thrust chambers and turbo-pumps that operate together! This was disclosed when the Soviets finally displayed the Vostok launch vehicle in Paris in 1967.

The standard Soviet space carrier rocket that has been used to launch most of their space missions during the first decade of the Space Age does indeed have six rocket engines as follows:

A single RD-107 rocket engine consisting of four main thrust chambers and two vernier thrust chambers supplied by a single turbo-pump in each of four parallel-staged strap on boosters.

A single RD-108 rocket engine consisting of four main thrust chambers and four vernier chambers supplied by a single turbo-pump in a central sustainer core.

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A series-staged top stage powered by a single combustion chamber and four vernier chambers.

The total number of Soviet-style rocket engines in this combination is six.

The total number of combustion chambers is twenty main, twelve main vernier, one top stage main, and four top stage vernier. But there are only six turbo-pumps in the vehicle.

The terminology makes a great deal of sense. A V-8 automobile engine is not considered to be eight engines just because it has eight combustion cylinders. It is considered to be an eight-cylinder *engine*.

In Paris, the Soviets also revealed their rocket engine and gave some performance data on it which is shown in Table I. The four-main plus two-vernier engine used in the booster strap-ons is the RD-107 engine. The RD-108 engine used in the sustainer core uses four of the same main chambers with four of the vernier chambers. The RD-107 and RD-108 engines are thus identical except for the number of vernier chambers, and all chambers of the *RD-107* and *RD-108* are fed from each engine's single turbo-pump.

There is nothing very unusual technically about the Soviet RD-107 except the high chamber pressure of sixty atmospheres (885 psi). But even in 1953 it was suspected that

TABLE I

SOVIET RD-107 ROCKET ENGINE DATA

(Data from Soviet display, Paris Air Show, le Bourget, May 26, 1967, and *Spaceflight* magazine, Vol. 9, No. 10, October 1967.

Type: Liquid-propellant, multi-chamber, turbo-pump fed.

Thrust in Vacuum: 102 t (228, 480 pounds)

Vacuum specific impulse: 314 lb-sec/lb

Chamber pressure: 60 atm. (885 psi)

Propellants: Liquid oxygen and hydrocarbon (kerosine?)

Configuration: 4 main thrust chambers, regeneratively-cooled, and 2 vernier chambers, supplied by propellants from single turbo-pump.

Turbo-pump details: Single shaft; double-sided LOX pump; single-sided fuel pump; centrifugal type. Driven by gas generator which in turn is fed by smaller centrifugal pump. Gas generator apparently driven by decomposition of hydrogen peroxide.

Injector design: Welded single-plate injector in each chamber.

Thrust chamber materials: External walls apparently steel. Internal walls of high copper alloy.

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the Soviets were using these high chamber pressures.[13] It permits a specific impulse of 314 lb-sec/lb from liquid oxygen and a hydrocarbon such as kerosine. Each individual main thrust chamber is a relatively small unit developing a vacuum thrust of about 56,000 pounds. This is actually less thrust than the German A4 engine which developed a vacuum thrust level of 70,000 pounds, but which was heavier and had a specific impulse of slightly over 200 because of a combustion pressure of only 14.5 atmospheres (215 psi).[14] You can't say that an RD-107 main chamber is just a souped-up A4 chamber because there is a great difference in chamber pressure as well as design.

The RD-107 main thrust chamber uses a single-plate injector of welded construction and vortex type injection of propellants.[15]

The Soviet engineers got their high-thrust rocket engine by clustering four well-proven thrust chambers together and supplying them with a single turbo-pump. It is much easier to design and build a small thrust chamber; you don't run into the kind of combustion instability problems that plague big thrust chamber design. It is much easier to cluster smaller thrust chambers and design and build the large single turbo-pump to supply them with propellants. A great deal of weight can be saved, also, by using the multiple-chamber plus single turbo-pump concept. The Soviet designers simply took advantage of the more rigorous technology of large turbines and large centrifugal pumps. And instead of going over the engineering hurdles of gimballing the main thrust chambers, they simply added smaller gimballed vernier chambers for pitch, yaw, and roll control purposes.

The RD-107/108 rocket engines were combined into a very large vehicle. The basic Soviet space booster/ICBM is a 1½-stage vehicle on which various top stages can be mounted. It consists, as stated above, of a core vehicle surrounded by four strap-on boosters. At liftoff, it operates as a parallel-staged vehicle. The four RD-107 engines and the RD-108 engine are ignited at the same time on the launcher. One must certainly applaud Soviet rocket technology for working out the techniques of igniting twenty main thrust chambers and twelve vernier thrust chambers at once!

The starting technique, as revealed by released Soviet films, derives directly from the German A4 start sequence.[16] The ignition signal from the blockhouse causes main propellant valves to open and tank vent valves to close. Propellants flow into all chambers by a combination of gravity feed and tank pressure. Although ignition in each chamber during this "preliminary stage" could be started by pyrotechnic igniters as in the German A4, a far more reliable method would be the use of "hypergolic

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leads"—filling the engine plumbing between tanks and main valves with propellants that would ignite spontaneously upon contact in the thrust chambers. Once the fires are going in all thirty-two chambers—probably detectable electrically by means of a meltable wire stretched across each chamber's exit nozzle, or some such similar detection means—and a low-thrust combustion process is under way, either a manual or automatic signal starts the hydrogen peroxide gas generators to spin-up the turbo-pumps. As the turbo-pumps force the propellants into the chambers during this "main stage" sequence, chamber pressure rises rapidly to sixty atmospheres and thrust builds up to a total liftoff value of 950,000 pounds. At this point, four arms swing back from hold-down points at the forward booster attachments and the umbilical towers swing back, leaving the vehicle free to lift off. As the Vostok launcher with a liftoff weight estimated to be 718,-800 pounds, the liftoff acceleration is 0.3 G. Total thrust increases with altitude to a vacuum value of 1,-150,000 pounds.

At some undisclosed time after launch, the tanks of the four strap-on boosters are depleted, and the RD-107 engines shut down. The four boosters then separate from the sustainer core. This may be accomplished by the firing of explosive bolts, or shaped charges, upon electrical command from the autopilot. The single RD-108 engine continues to produce 228,480 pounds of vacuum thrust to continue accelerating the vehicle.

This basic booster-sustainer vehicle is capable of orbiting a payload of 3,087 pounds in addition to the "hammerheaded" sustainer core of the vehicle, according to a statement made by Soviet professor G. V. Petrovich in February 1968.[17]

The Soviets began flying this vehicle early in 1957. On August 28, 1957, the Soviet news agency Tass announced the successful launching of a "super long-distance intercontinental multistage ballistic rocket . . . a few days ago."[18] The U.S. Department of Defense had long-range radars based in Turkey that had been following the Soviet ICBM tests from Tyuratam, plus photographs from overflights of U-2 aircraft. Following the Tass release, the U.S. Department of Defense announced on August 30, 1957 that four to six Soviet ICBM tests had taken place in the spring of 1957.[19]

The IGY was in full swing at that time, and the Soviets had announced on July 30, 1955 that it would fly a satellite during the IGY.[20] Those of us who were in the rocket business at that time knew that an ICBM could orbit a satellite, that the Soviets had a working ICBM, and that the Soviets would orbit a satellite. Some U.S. rocketeers were waiting for the Soviet shoe to drop on September 17, 1957, the one hundredth birthday of Tsiolkovski. It

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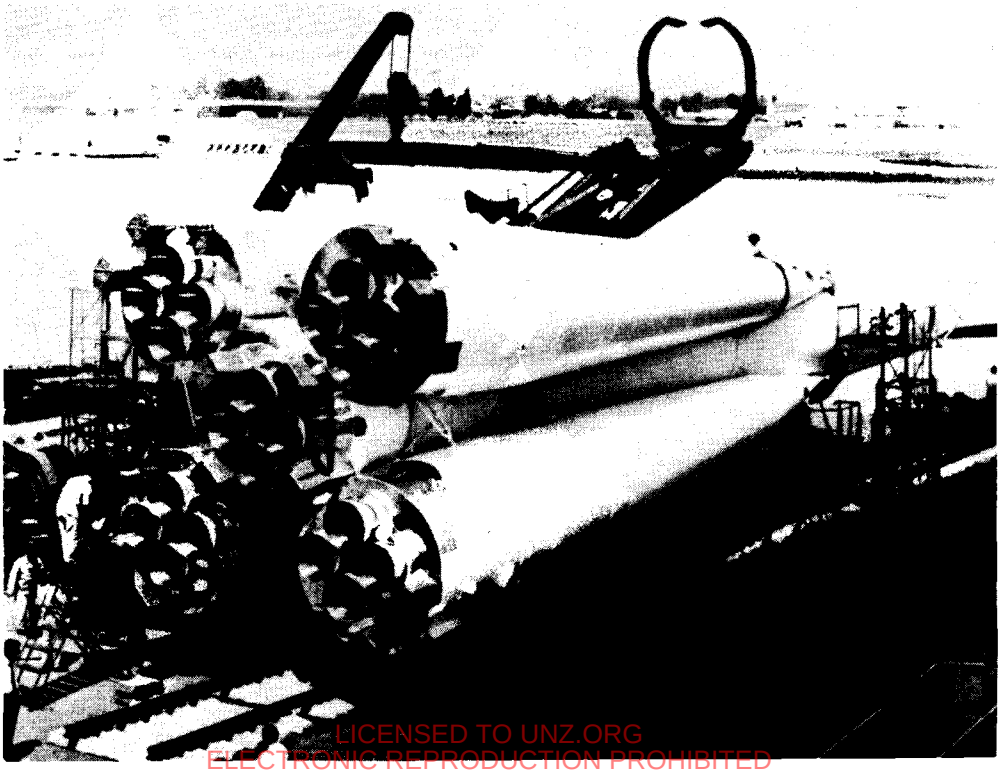
didn't drop until October 4, 1957. It was not a surprise to anyone who knew what was going on. In fact, the Soviets had even announced in their magazine, *Radio,* in June 1957 that their satellite would transmit on 20 MHz and 40 MHz[21]—which, incidentally, loused-up our WWV time station when it did go into orbit.

When it did happen, a young U.S. rocket engineer told United Press that Sputnik-I "means the Russians must have used their intercontinental ballistic missile to get it into orbit."[22] For saying that, the engineer lost his job with a large aerospace firm the next day. I was that engineer. Later, on April 15, 1958, Dr. Wernher von Braun told the Select Committee on Astronautics and Space Exploration of the 85th Congress, "We have ample evidence that the Russians have ICBMs successfully flying over a range of many thousands of miles, whereas we have not. It is further obvious that the Russians have used such ICBM rockets to launch their two sputniks into orbit."[23]

In February, 1968, Tass released a photograph of the launch vehicle

The 20 main thrust chambers of the Vostok booster are clearly visible here in photo taken during assembly of vehicle at Paris, May 1967. (Space Business Daily *photo*)



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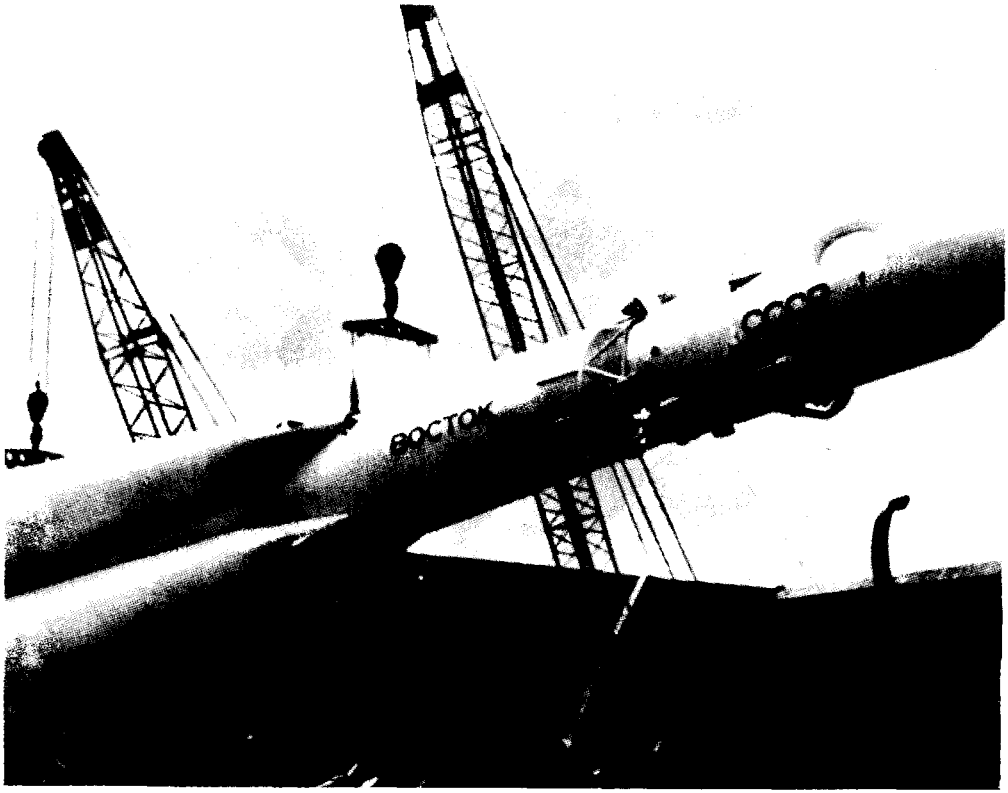

An extremely strong vehicle, the Soviet Vostok launcher is picked up by two cranes during assembly at the 1967 Paris Air Show. (Space Business Daily *photo*)

for the sputnik satellites; it is the same basic booster-sustainer vehicle displayed in Paris, minus the top stage.

This booster-sustainer vehicle is the Soviet T-3 ICBM.

Although the 24-inch diameter spherical Sputnik-I weighed 184 pounds, it is not generally known that the Soviets orbited a total weight of over 8,000 pounds on that first space shot.[24] They came closer to the orbital capability of the vehicle with Sputnik-II, which weighed 1,120 pounds with the dog Liaka aboard, and again over 8,000 pounds were orbited.[25] In fact, the Soviets did not separate Sputnik-II from the sustainer core. Sputnik-II was bright; I watched it go overhead many times. It was photographed in orbit from the Cape Canaveral tracking telescopes, and the RCA Service Company estimated its length to be between 74 and 84 feet. The Royal Aircraft Establishment in England estimated from tracking data that Sputnik-II was 7.6 feet in diameter and 65.6 feet long.[26] The actual length of the So-

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viet carrier rocket's sustainer-core with a Sputnik shroud is about 95 feet long and 9.679 feet maximum diameter. This is pretty close figuring for an object that was over 100 miles up when it was tracked and photographed!

Two things should be noted at this point:

1. On December 18, 1958, the U.S. placed an entire Atlas-B in orbit weighing 8,750 pounds and 80 feet long.[27] Total weight in orbit was about 3,000 pounds less than that orbited by the Soviet carrier rocket with Sputnik-III launched on the 15th of May in that year. The United States did not match this weight in orbit until the OGO flights in 1964.

2. The Soviet T-3 ICBM and standard space carrier rocket is just a little bit larger, heavier, and more powerful than the proposed 1953 Atlas designed to carry the heavy warheads of that time. The Soviets built their version; we didn't. The United States did not fly a vehicle of greater size, weight, and thrust until the launch of the Saturn-I on October 27, 1961, nearly five years after the first launches of the Soviet T-3.

In 1959-1960, the Soviets improved the orbital capability of their carrier rocket by adding a top stage. Whereas the 2,926 pounds of Sputnik-III was getting near the limit of the basic vehicle, the addition of the top stage increased the orbital capability of the vehicle to over 10,000 pounds. This also permitted the Soviets to use it for deep-space missions to the Moon and planets. This complete 2½-stage vehicle, essentially the same as displayed in Paris in 1967, was first tested on the Luna-1 shot of January 2, 1959.[28] And the stage was set for the Soviet manned orbital program.

The Soviets did not go at their manned orbital program without considerable flight testing, man-rating, and concern for cosmonaut safety. Korabl Sputnik 1, launched May 15, 1960, put the 10,000-pound unmanned Vostok spacecraft into orbit for the first time. When they started the unmanned portion of the manned program, they had at least six tests of the vehicle as an ICBM (probably more), three successful orbital sputnik shots, and three lunar shots. They had also lobbed a number of vehicles into the Pacific. Their program was not without problems, however; they lost Korabl Sputnik 1, which is still orbiting at this writing due to a malfunction of the re-entry sequence. Korabl Sputnik 3, another unmanned Vostok precursor flight, burned up on re-entry. However, at the time the vehicle was man-rated for the first manned orbital flight, they had a score of sixteen successful space launches (that we know of) and two failures (that we know of). There were probably more flights than this. But when Major Yuriy Alexseyevich

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Gagarin, age twenty-seven, of the Red Air Force rode the Vostok 1 once around the world into history on April 12, 1961, he was boosted by a highly reliable, thoroughly man-rated system.

What about the persistent rumors that the Soviets lost up to fourteen cosmonauts? The Italian newspaper *Corriere Della Sera* claims that the Soviets have lost this many since November 28, 1960, has even named them, and has given dates of their "deaths." The Judica-Cordilla brothers, radio hams in Turin, Italy, have reported receiving radio messages from Soviet cosmonauts in their death throes. A letter from Lieutenant General Nikolai Kamanin, chief of Soviet Cosmonaut Training, was printed in the May 15, 1965 issue of *Aviation Week & Space Technology* vigorously denying any cosmonaut deaths in orbit or in spacecraft.[29] I have compared the dates of the alleged deaths of Soviet cosmonauts as reported by *Corriere Della Sera* with the known log of Soviet flights to orbit or beyond, and there are no known Soviet flights to orbit or beyond on those dates. The exception is the confirmed death of Colonel Pyotr Dolgov on November 1, 1962 who, according to Kamanin, perished in a parachute jump from the stratosphere.[30] On that same day, the Soviets launched Tyazheliy Sputnik into a parking orbit from which Mars-1 was dispatched. It seems highly unlikely that the Soviets would have launched a manned orbital flight on the same day as a major interplanetary shot of some importance to them.

There is no published log of Soviet flights that failed before orbit was attained, so I could not check the *Corriere Della Sera* list against that possibility.

However, when the Soviets did lose a man, Komarov, in a manned space flight, they did not hide the fact. It caused a hiatus in the Soviet manned spaceflight program; there was no hiatus in the Soviet Vostok program. It seems highly unlikely to me that the Soviets would lie about this; they have not lied about their space program in the past; they stand to lose a great deal if they were caught lying, because the U.S. orbital tracking and detection systems would indeed catch them at it. If the Soviets have lost cosmonauts, they lost them on the pad or during boost to orbit. Again, this seems unlikely due to the design of the Vostok spacecraft.

Considerable attention was paid to cosmonaut safety by Korolev and his Vostok designers, and these details came to light when a complete Vostok spacecraft was displayed in May 1965 at the Cosmos Pavilion of the USSR Electronic Achievements Exhibition in Moscow. The Vostok spacecraft was subsequently displayed at the 1967 Paris Air Show and at Expo 67 in Montreal. The 10,000-pound-plus orbital weight capability of the So-

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viet space rocket permitted Soviet designers considerably more leeway in weight than was available to NASA in the Mercury program with the Atlas-D booster. So Korolev went to straightforward design concepts based on known data and requiring little R&D work.

The Vostok is a modular spacecraft like the U.S. Gemini. Nominal orbital weight is given as 4,725 kilograms (10,422.5 pounds) including cosmonaut.[31] The spacecraft consists of a 96-inch diameter spherical command module and re-entry body, a service module carrying orbital electronics and consumables as well as the re-entry rocket engine, and the entire top stage of the carrier rocket. An aerodynamic nose shroud covers the spacecraft during launch and is jettisoned probably after the launch vehicle leaves the atmosphere.

The top stage of the carrier rocket remains attached to the space-

TABLE II

SOVIET "VOSTOK" CARRIER ROCKET DATA

(Data from Soviet display, Paris Air Show, le Bourget, May 28, 1967, and from various other published sources.)

Length overall: 38 meters (124.678 feet)
Diameter over fins: 10.3 meters (33.794 feet)
Sustainer length: 28 meters (91.868 feet)
Maximum diameter of sustainer: 2.95 meters (9.679 feet)
Length of boosters: 19 meters (62.339 feet)
Maximum diameter of boosters: 3 meters (9.843 feet)
Top stage length over nose fairing: 10 meters (32.81 feet)
Maximum diameter, top stage: 2.58 meters (8.465 feet)
Nominal Vostok weight, including pilot: 4725 kg. (10,400 lb)
Total thrust, liftoff: 950,000 lb.
Total thrust, vacuum: 1,150,000 lb.
Estimated weights:

Propellants in 4 boosters:	375,000 lb
Propellants in sustainer:	240,000 lb
Propellants in top stage:	32,000 lb
TOTAL PROPELLANTS:	647,000 lb
Vostok spacecraft:	10,400 lb
Empty vehicle:	61,400 lb
TOTAL EMPTY WEIGHT:	71,800 lb
LIFTOFF WEIGHT:	718,800 lb

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craft in orbit, probably for several reasons. It mounts the only attitude control thrusters visible on the entire spacecraft assembly.

The engineering rationale of the design is most evident in the de-orbit, re-entry, and landing sequence. Part of this sequence is based on Soviet information, and part is based on an analysis of what must occur in addition.

In preparation for de-orbiting, the top stage vernier-thrusters orient the spacecraft with its aft end in the direction of the orbital velocity vector. It cannot be determined if a pitch angle is also used. The top stage vernier-thrusters might also impart a roll to the spacecraft. The top stage is then separated from the service and command modules.

The base of the service module is nested into the top stage and is reportedly a conical frustrum. The service module itself has never been displayed so that this can be seen, but its base has been shown in both Czech and Polish drawings.[32] The de-orbit rocket engine is located at the small end of the frustrum. It is fired to reduce the orbital velocity.

Apparently, thrusters on the service module that have not been visible on the displayed Vostoks then reposition the vehicle for re-entry, aft-end first. The service module is then separated from the spherical command module.

The spherical shape was chosen by Korolev and his Vostok designers because the aerodynamic characteristics of a sphere over a wide range of Mach numbers was well known. Such a re-entry module is much heavier than the blunted-cone shape chosen by the U.S. team, but the Soviets did not have to worry about weight problems to the same degree. The 96-inch-diameter Vostok re-entry sphere is coated with an ablative material on the hemisphere at the cosmonaut's back. The remainder of the sphere is covered with honeycomb material.[33] While in orbit, the entire module is covered with aluminum foil for thermal control.

The re-entry sphere has an offset center of gravity, making it heavier in the hemisphere at the cosmonaut's back. This provides some stabilization during re-entry. Because this type of stabilization would permit rather wide oscillatory excursions, it is also highly probable that the sphere re-enters with an imparted roll—created probably by thrusters on the service module before separation—to aid in stabilization. The module has no drogue parachute. It literally falls like a ball from orbit. Even with an offset CG and imparted roll, it is likely to undergo considerably more oscillation during re-entry than the U.S. capsules, and riding a Vostok through re-entry must be some roller-coaster ride!

There are protective shutters that can be closed over the inner surface of the viewports during re-entry, but Titov reported that he left these

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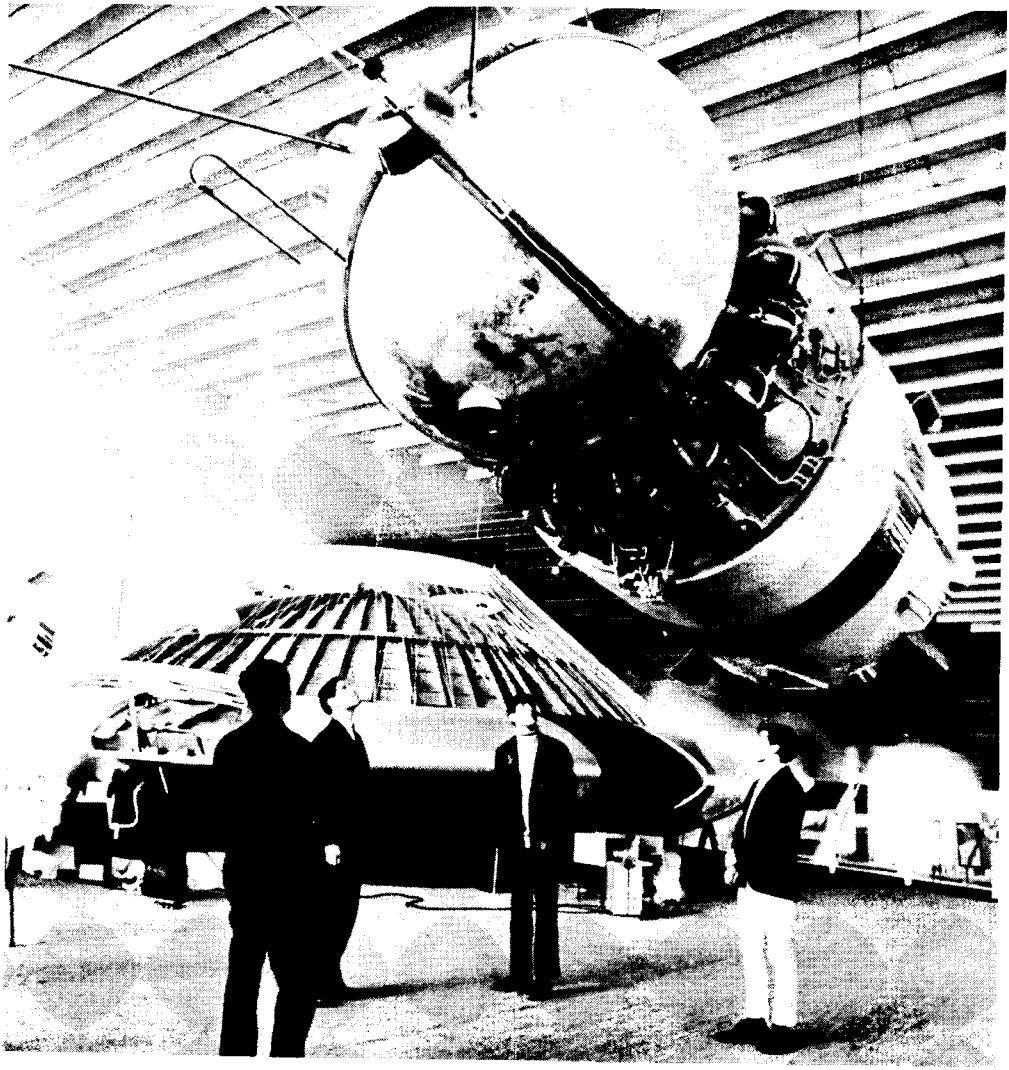

The Vostok sphere is held to the service module by straps which also mount orbital communications antennas. Sphere is covered with aluminum foil for thermal protection. Displayed here at Expo 67 in Montreal. The saucer shaped object in the background is Unidentified. (CTK photo)

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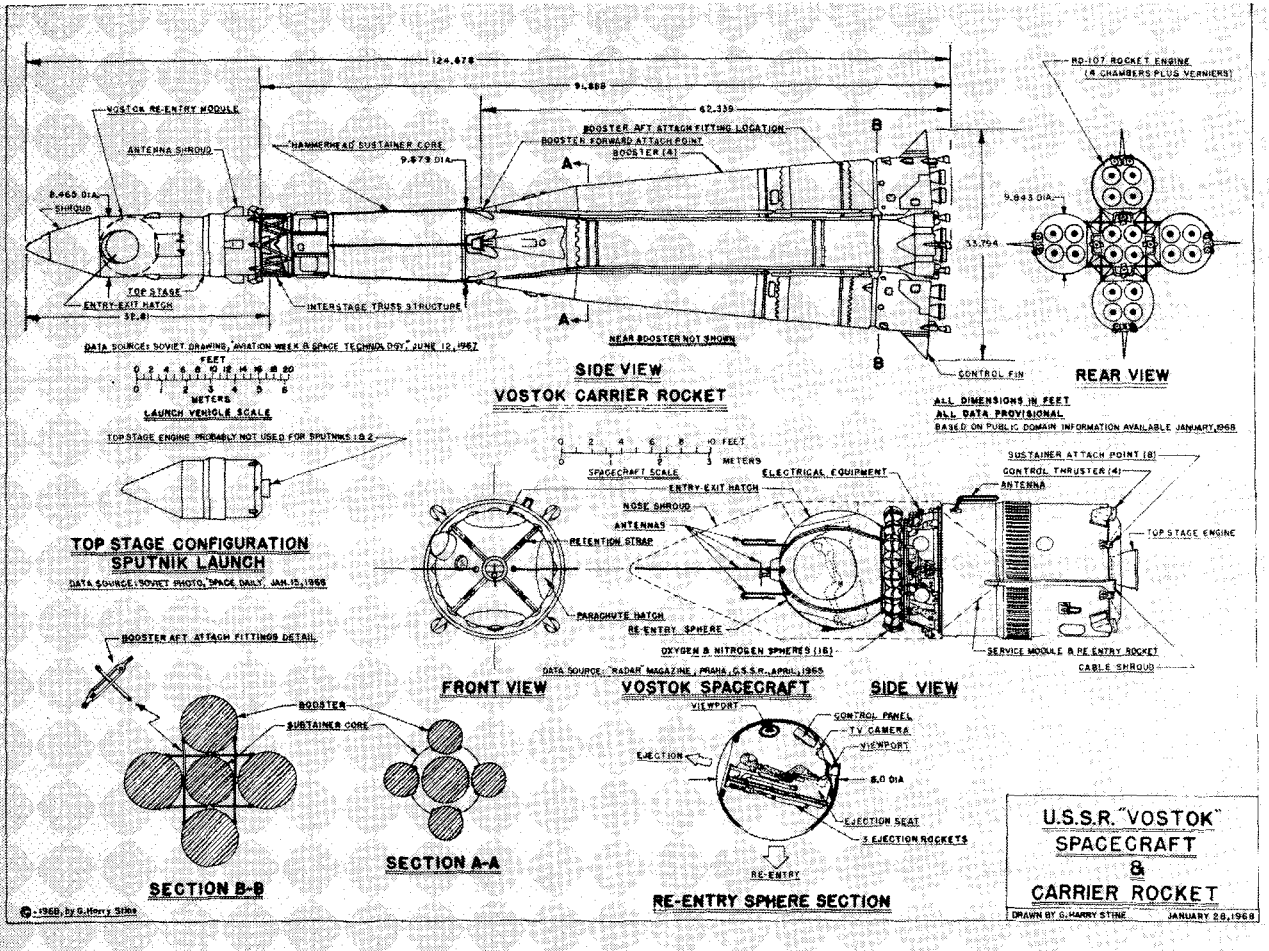

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ports open to see what it was like.[34]

At about 23,000 feet, the cosmonaut is ejected from the capsule. The entry-exit hatch blows off, and three ejection seat rockets fire to propel the cosmonaut and his seat away from the sphere. The cosmonaut then separates from the seat and descends under a regular personnel parachute to land separately from the capsule.

Another hatch blows off the side of the sphere at about 16,000 feet, and the capsule recovery chute deploys, landing the capsule at a velocity of about 33 feet per second.

Although the Soviets and their cosmonauts stated that it was possible to land with the cosmonaut inside the capsule, all six Vostok cosmonauts used the ejection landing sequence on their flights.

Why did the Soviets choose this recovery sequence?

They always utilized a land recovery, and the impact forces on touchdown are much more severe than with a water recovery such as used by the U.S.A. In addition, the only available volume in the command module sphere for parachute stowage is small and on the side of the sphere. If the cosmonaut stayed inside the capsule, he would have to take the capsule chute opening shock and the landing shock on his side. Undoubtedly, this can be used in an emergency when the cosmonaut cannot eject, but it would be a rough landing. The ejection seat was probably originally installed for emergency abort during launch and early flight; the aerodynamic shroud over the spacecraft on the launch vehicle has a very large, unfaired opening for this purpose. Therefore, the ejection seat could also be used to get the cosmonaut out of the capsule to land under his own chute, simplifying the recovery chute design for the capsule and permitting less space to be occupied by said recovery chute.

To sophisticated eyes of Western engineers, the Vostok system may appear at first glance to be crude. But it worked. There were six completely successful manned orbital flights with the system. One of these flights was made by a woman. The purposes of the Vostok program were admirably served by the system. The Soviets got important data on the reactions of a man (and a woman) to orbital flight for long durations. The U.S.A. didn't come close to equalling the total Soviet time in orbit until the Gemini program got rolling. The Vostok was a prime example of Soviet engineering, eminently pragmatic while appearing to be crude and heavy-handed.

A further example of this is their launch pad technique, revealed by Soviet movies of operations

Scale drawing of the Soviet carrier rocket and the Vostok spacecraft. This drawing represents the data available on January 28, 1968.

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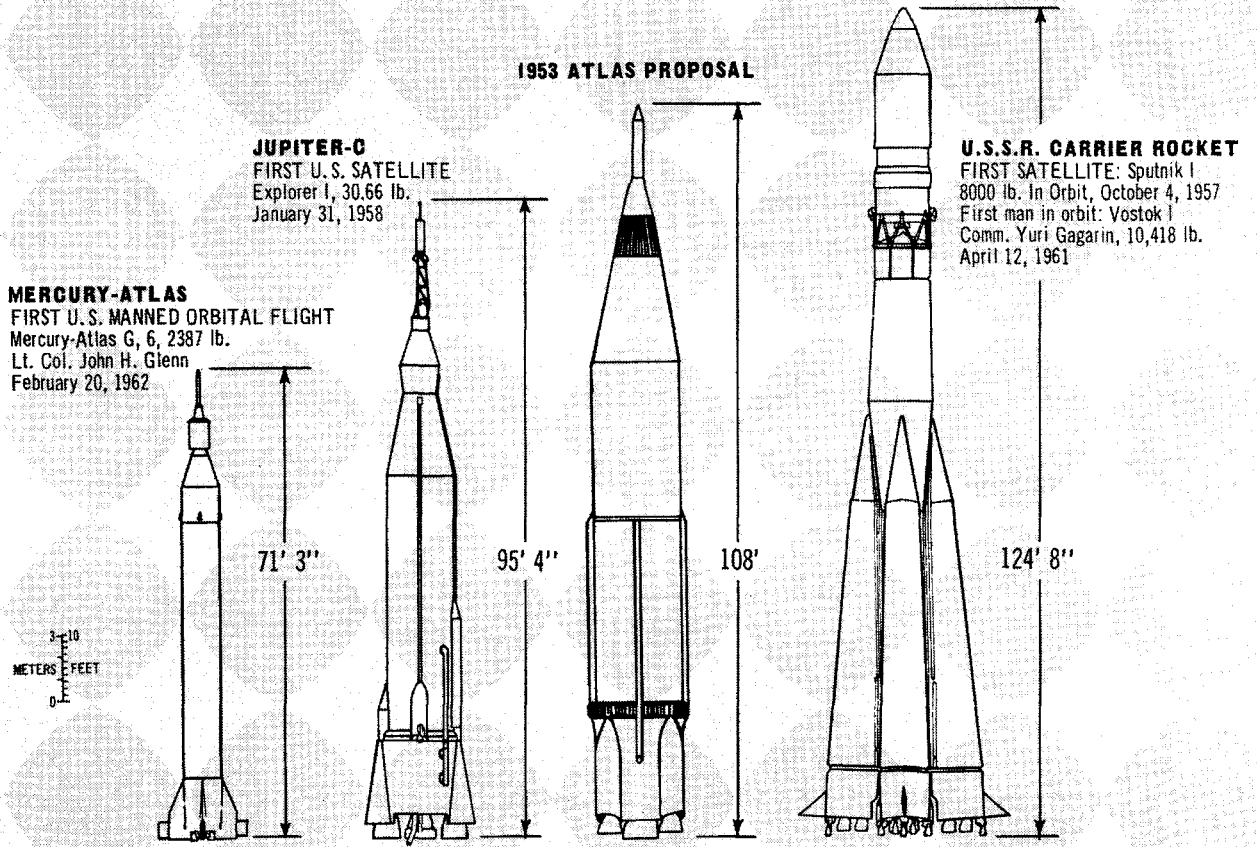

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at the Tyuratam Cosmodrome.[35]

The design of the carrier rocket with its strap-on boosters permits a much shorter, stiffer vehicle than a comparable series-staged vehicle. In contrast to our paper-thin Atlas, the Soviet carrier rocket is built like a brick balalaika factory. During assembly operations for the Paris Air Show display of the vehicle, it was picked up by two crane-lifted strongbacks at the forward and aft booster attachment points, and technicians walked up and down all over it. It was designed for horizontal assembly and transport.

The carrier rocket is assembled in a large hangar at Tyuratam just as it was assembled at Paris: horizontally, directly on its hydraulically-actuated erector mounted on a railway car.

The Vostok spacecraft are also assembled in an open hangar at Tyuratam. In great contrast to U.S.A. practice, no "white room" techniques are used. The Vostoks are very rugged devices. Pictures show a technician, clad only in a lab smock, wiring-up the Vostok command module with a 250-watt soldering iron.[36] Vertical assembly is used initially for the spacecraft. The command module is attached to the service module, and the initial hangar checks are run, first with a dummy cosmonaut, then with a live one. The spacecraft is then rotated to the horizontal in its assembly fixture and mated to the top stage of the carrier rocket. The aerodynamic shroud is put on, and the entire vehicle rolls horizontally, rear end first, on its rail car erector out of the launch pad. Here, the erector swings it up to the vertical, the hold-down arms are attached, and the erector moves away to permit the rail-mounted service tower to move in. On the pad, only final checks are carried out.

This system of horizontal assembly and check-out in the hangar followed by erection, check-out, and launch is probably the reason why the Soviets were able to launch Vostok 3 on August 11, 1962 followed by Vostok 4 on the following day. They either have two launching pads, or, more consistent with their exhibited philosophy of doing the best they can with what they've got, they have a very rapid pad re-cycle time. The latter is most likely the case. They can assemble and check-out two Vostoks and carrier rockets at the same time in the hangar, then move them sequentially to the pad. This is in contrast with the U.S.A. practice in the Gemini program where the Gemini-Titan "stack" had to be assembled and checked-out on the pad itself, requiring a week's re-cycle time between Gemini 7 and Gemini 6. It seems unlikely that the U.S.A. can even match the twenty-four-hour re-cycle time with the Saturn V's Complex 39.

Following the Vostok's 6-flight program, the Soviets went right into

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the Voskhod multi-manned program with only one precursor flight, Kosmos 47. The reason was simple. They used the same booster-sustainer vehicle with an up-rated top stage some 18 feet longer, carrying more propellants and possibly the RD-119 engine, possibly 2 RD-119 engines.[37] A study of released photos of the spacecraft indicates that the command module is the same 96-inch-diameter Vostok module. With the ejection seat removed and the side-mounted capsule recovery chute compartment relocated, it is possible to seat three cosmonauts side-by-side in the sphere. In Voskhod 2, the weight of one cosmonaut and his seat was replaced with the collapsible airlock used by Leonov for his EVA.

No ejection seats were installed in the Voskhod capsule, and the cosmonauts landed in the capsule. This means that the Soviet engineers had gained a high level of confidence in the booster rocket and had perhaps modified the de-orbit rocket engine to act as an escape rocket for a liftoff abort. What did they do with the parachute compartment? The crude blackboard sketch drawn by Leonov when he explained his EVA at the post-shoot press conference shows a canister on the front or top end of the Voskhod command module.[38] This is probably the capsule recovery parachute container. It seems logical, since this location of the canister would permit a riser attachment point in such a place to allow the landing of the command module with the cosmonauts on their backs.

The Soviets also claimed that retro rockets were used to ease the landing of the capsule. Unless they have a detachable heat shield, which is not evident from the photographs of the landed Voskhod sphere, I cannot figure out where they would put them so that they would withstand the conditions of re-entry.

Basically, the Voskhod was an improved, up-rated Vostok that made use of what had been learned during the Vostok program.

Where will the Soviets go from here? What did the ill-fated Soyuz 1 spacecraft look like? Did it use a different carrier rocket? Are the Soviets building a space booster bigger than Saturn V? We will probably know the answers to these questions in due time. In the meantime, we can continue with the fun-and-games of speculating in a technical manner about them.

On July 16, 1965, the Soviets orbited Proton 1. It weighed 26,840 pounds, plus carrier rocket. This spacecraft, as displayed in Paris in 1967, has a diameter of 14.8 feet. It was a cosmic-ray research satellite, and the Soviets flew two of them in 1965 and another in 1966.

In April 1967, Soviet scientific sources disclosed that the Soyuz 1 was orbited by a new carrier rocket with a thrust between 5 and 6 million pounds.[39] They also confirmed that Soyuz 1 was a command mod-

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ule designed to provide the core of a manned space station of long duration as well as to carry cosmonauts to the moon with flight durations up to eight days. The Soyuz launch vehicle would appear to represent the final development of the Proton launcher. The final flight testing of this vehicle was completed in late 1966.

If the Soviets already have a launch vehicle just slightly smaller than this Saturn V, if they have already accomplished fully automatic rendezvous and docking (Kosmos 186/188), and if they have preserved the rapid launch pad recycle time of the Vostok program, they have everything necessary right now for the establishment of a manned space station and a manned lunar landing.

The Soviet Union has obviously learned a great deal about space technology—from its own accomplishments, from the German Peenemunde program, and from the United States' program. It remains to be seen if the United States can learn anything from the manner and way the Soviet Union has conducted its space program. ■

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SOVIET SPACE CARRIER ROCKET FLIGHT HISTORY

(From published U.S. sources)

August 30, 1957; U.S. Department of Defense announced 4 to 6 Soviet ICBM tests during Spring, 1957.

October 4 1957; Orbited Sputnik-I, 184 pound sphere; 8000 pounds in orbit. 142 x 588 miles. Down January 4, 1958.

November 3, 1957: Orbited Sputnik-II, 1,120 pounds with dog Laika aboard; 8000 pounds in orbit. 140 x 1038 miles. Down April 4, 1958.

May 15, 1958: Orbited Sputnik-III, 2,925 pounds. 135 x 1167 miles. Down May 6, 1960.

January 2, 1959: Launched Lunik-I into solar orbit, 3245 pound capsule. First use of top stage.

September 12, 1959: Launched Lunik-II to lunar impact. 858.4 pounds of instruments to lunar hard landing.

October 4, 1959: Launched Lunik-III to lunar orbit. 614-pound spacecraft made first photos of lunar farside.

February 12, 1961: Orbited Sputnik-V. 1419-pound Venus probe failed to get out of 115 x 155 mile parking orbit.

September 1, 1962: Orbited Venus-I. Probe failed in parking orbit.

November 1, 1962: Launched Mars-I, 1980 pounds.

January 4, 1963: Orbited 3080-pound un-named spacecraft which failed in parking orbit.

April 2, 1963: Launched Luna-4, 3136-pound soft landed, failed.

March 12, 1964: Launched Kosmos-60, 3200-pound lunar soft lander, failed in parking orbit.

May 9, 1965: Launched Luna-5, 3255 pounds, impacted on Moon.

June 8, 1965: Launched Luna-6, 3180 pounds, missed lunar impact.

June 18, 1965: Launched Zond-3, 2000 pounds, lunar photo orbiter, 25 photos of lunar farside.

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October 4, 1965: Launched Luna-7, 3321 pounds, impact on Moon.
December 3, 1965: Launched Luna-8, 3422 pounds, impact on Moon.
January 31, 1966: Launched Luna-9, 3491 pounds, soft landed on Moon. 27 photos returned. First lunar soft landing.
March 1, 1966: Launched Kosmos-111, 3500 pounds, lunar shot failed in parking orbit.
March 31, 1966: Launched Luna-10, 3588 pounds, orbited Moon.
August 24, 1966: Launched Luna-11, 3616 pounds, orbited Moon.
October 22, 1966: Launched Luna-12, 3600 pounds, returned photos from lunar orbit.
December 21, 1966: Launched Luna-13, 3600 pounds, soft landed on Moon, returned photos.

MANNED PROGRAM

May 15, 1960: Launched Korabl Sputnik 1, 10,008 pounds. Recovery failed. Still in orbit (early 1968).
August 19, 1960: Launched Korabl Sputnik 2, 10,120 pounds. 2 dogs, rats, mice, flies, plants, seeds, fungus, etc. Recovered 7 miles from target on August 20, 1960.
December 1, 1960: Launched Korabl Sputnik 3, 10,060 capsule. Recovered December 2, 1960.
February 4, 1961: Launched Sputnik-IV, 14,292-pound capsule. Down February 26, 1961.
March 9, 1961: Launched Korabl Sputnik 4, 10,340-pound unmanned Vostok with dog aboard. Recovered March 9, 1961.
March 25, 1961: Launched Korabl Sputnik 5, 10,330-pound unmanned Vostok with dog aboard. Recovered.
April 12, 1961: Orbited Vostok 1 with Gagarin aboard. Recovered after 1 orbit. First manned orbital flight.
August 6, 1961: Orbited Vostok 2 with Titov aboard. Recovered after 17 orbits.
August 11, 1962: Orbited Vostok 3 with Nikolayev aboard. Recovered after 64 orbits.
August 12, 1962: Orbited Vostok 4 with Popovich aboard. Recovered after 48 orbits.
June 14, 1963: Orbited Vostok 5 with Bykovskiy aboard.
June 16, 1963: Orbited Vostok 6 with Valentina Treshkova aboard. First woman in orbit.
October 6, 1964: Orbited Kosmos 47, 11,700-pound unmanned Voskhod precursor flight. Recovered after 16 orbits.
October 12, 1964: Orbited Voskhod 1, 11,700 pounds, three-man flight with Komarov, Yegorov, and Feoktistov aboard. Recovered after 16 orbits.
February 22, 1965: Orbited Kosmos 57, 12,500-pound unmanned Voskhod precursor. Failed in orbit, not recovered.
March 18, 1965: Orbited Voskhod 2, 12,500-pound flight with Belyayev and Leonov aboard. First EVA by Leonov. Recovered after 17 orbits.

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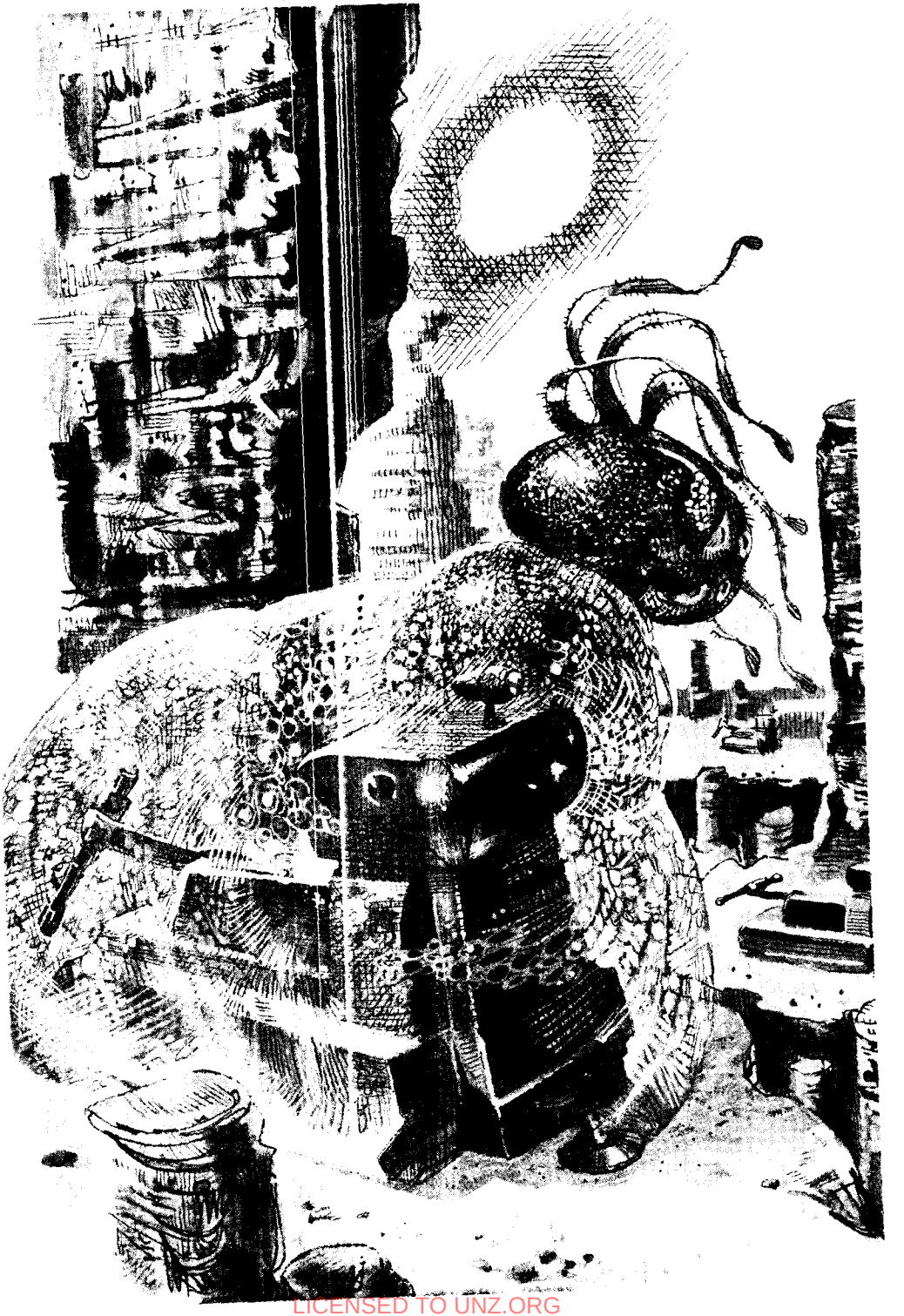

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Appointment on Prila

BOB SHAW

Illustrated by Leo Summers

No ordinary man could have defeated the monster on Prila I—but not even the alien, Candar, could catch Captain Aesop's mind!

Candar waited for seven thousand years before he saw his second spaceship.

He had been little more than a cub when he saw the first, but the picture was still clear in his mind. It had been a warm, moist morning and his mother and father had just begun cutting through a village of the two-legged food creatures. Candar was quietly watching their great gray bodies at work when he became aware of the ship. It came low, and was traveling so fast that the damp air was compressed into opaque gray clouds inside the shock waves created by its blunt nose. The clouds swirled round it like a tattered cloak so that the ship skipped in and out of visibility, and Candar wondered how anything could move at such a speed and not make any sound.

It was not until after the ship had passed overhead that the sound came, leveling the food creatures' flimsy huts even more efficiently than mother and father could have done. The ship banked sharply, halted high in the morning air and suddenly Candar and his parents were lifted into the sky. Candar deduced that he was caught in some kind of a force field. He measured its frequency, wavelength, intensity, and even discovered that his brain could produce a similar field of its own—but he could not get away. He and his parents were rushed upwards to where the sky turned black and Candar could hear the stars and, then, some time later, his mother and father were released. They vanished in a few seconds and Candar, already adapting to the new environment, realized that his parents

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had been steered into a course which terminated in the Sun. Judging by their agonized struggles as they dwindled from view, his mother and father had performed the same calculation.

The sun shrank, became a star, then much later a double star blossomed and became two egg-shaped suns courting each other in a binary ritual. Ten miles above a planet of black rock which wobbled a precarious orbit between the suns the spaceship let Candar drop. Only by converting his body into miles of springy, hair-thin organic wire did he survive the fall, and by the time he had re-formed his sense organs the ship was gone.

Candar knew that he had been imprisoned. He also knew that on this world which could carry no trace of food he would eventually die, and there was nothing to do but wait.

His new world made its painful run between the two suns every year; each time the black rock melted and ran like mud and nothing survived unchanged but Candar —and it was seven thousand years before he saw his second spaceship.

The thing Surgenor detested most about high-gravity planets was the speed at which beads of sweat could move. A trickle of perspiration could form on his brow and, with a rush like an attacking insect, be down the side of his face and under his collar before he could raise a hand to defend himself. In sixteen years of survey work he had never become used to it.

"If this wasn't my last trip," Surgenor said quietly, "I'd refuse to do any more."

"Can I have time to think about that one?" Voysey, who was on his second trip, kept his eyes on the survey module's controls.

"You've *got* time," Surgenor said. "Everybody on this job has time." He decided to talk about something else. "I'll bet you ten stellars we see the ship from the top of this hill."

"Already!" Voysey became alert and started setting verniers on the range-finder panel.

Already, Surgenor thought. It felt like centuries since the mother ship had set its six survey modules down at the black planet's south pole and ghosted back into the sky to do a half circuit and landing at the north pole. The ship would have completed the journey in half an hour—the men in the modules had had to sweat it out under three gravities for twelve days as their machines zigzagged along the planet's surface. Had there been an atmosphere they could have switched to ground-effect and traveled twice as fast, but even as it was they had made good time.

The car reached the top of the rise and the horizon, which was the line separating starry blackness from dead blackness, dropped away

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in front and Surgenor saw the clustered lights of the *Sarafand* down on the plain about five miles from them.

"You were right, Dave," Voysey said and Surgenor grinned at the note of respect in his voice. "I think we're going to be first back, too. I don't see any other lights."

Surgenor nodded. Strictly speaking, all six modules should have been exactly the same distance out from the *Sarafand* in their respective directions, ranged in a perfect circle. During most of the journey the vehicles had adhered rigidly to the search pattern so that the data they were transmitting to the mother ship always reached it from six equally distant, equally spaced points. Any deviation from the pattern would have caused distortion in the planet map being built up in the ship's computer deck. But each module had an awareness radius of five hundred miles, with the result that when they got to within half that distance of the mother ship the remaining territory was being mapped six times over, and the job was well and truly finished. It was an unofficial tradition that the last two-hundred-and-fifty-mile leg of a survey was an out-and-out race for home, with champagne for the winners and an appropriate salary deduction for the losers.

Module Five, which was Surgenor's vehicle, had just skirted a low but jagged range of hills and he guessed that at least two of the others would have had to go over the top and lose time. Somehow, in spite of all the years and light-years, he felt some excitement. It might be nice to finish his career in Cartographical Service with champagne.

"Here we go," Voysey said as the vehicle gathered speed on the downward slope. "A shower, shave and champagne—what more could you ask for?"

"Well, even if we stick to the alliteration," Surgenor replied, "there's steak, sex, sleep . . ."

He stopped speaking as the voice of Captain Aesop on board the *Sarafand* boomed from the radio grill.

"This is *Sarafand* speaking to all survey modules. Do not continue your approach. Cut your motors and remain where you are until further notification. This is an order."

Before Aesop's voice had died away the radio silence that had been observed during the race was broken as startled and angry comments from the other modules crashed from the speaker. Surgenor felt the first cold feather-flick of alarm—Aesop had sounded as though something was seriously wrong. *Module Five* was still churning its way downward into the blackness.

"It must be some kind of mistake," Surgenor said, "but you'd better cut the motor anyway."

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"But this is crazy! Aesop's crazy! What could go wrong?" Voysey sounded indignant. He made no move to touch the motor controls.

Without warning, an ultralaser burst from the *Sarafand* splintered the night into dazzling fragments and the hillside lifted skywards in front of *Module Five.* Voysey hit the brakes and the vehicle slid to a halt on the glowing edges of the ultralaser scar. Falling rock hammered on the roof in an irregular, deafening frenzy, then there was silence.

"Aesop's gone mad," Voysey said numbly, almost to himself. "Why did he want to do that?"

"This is the *Sarafand,*" the radio blared again. "I repeat. No survey module is to attempt to approach. I will be forced to destroy any other module which fails to obey this order."

Surgenor pressed the button which put him on the air.

"This is Surgenor in *Module Five,* Aesop. You'd better tell us what's going on."

There was a pause, then Aesop spoke again. "Six cars went out on this survey—seven have come back. I need hardly point out that this is one too many."

With a sudden spasm of alarm Candar realized he had made a mistake. His fear stemmed not from the fact that the strangers had deduced his presence, or that they had reasonably potent weapons, it came from the knowledge that he had made such a simple error. The process of deterioration must have gone much further than he had realized.

The task of reforming his body to look like one of the traveling machines had been a difficult one, but not so difficult as the vast cellular reorganization which enabled him to survive when the two suns were overhead. His mistake had been to allow the machine, whose shape he had copied, to come within range of the scanning device aboard the largest machine. He had allowed the small machine to draw away from him while he went through the agony of transformation and then, when he went after it, had become aware of the pulsing spray of electrons sweeping over him. He should have deduced in advance that creatures with the feeble sense organs he had perceived would have striven for something to widen their awareness of the universe. Especially creatures who would take the trouble to build such complicated vehicles.

Candar's alarm faded away as he picked up the currents of fear and bewilderment stirring in the minds of the beings in the machines nearest to him. Minds like these could never present any serious problem —all he had to do was await his chance. He crouched on the cracked surface of the plain, most of the metallic elements in his system transferred to the periphery of

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his new shape, which was now identical to that of the traveling machines. A small part of his energy was going into producing light which he beamed out in front, and occasionally he emitted bursts of radio waves at frequencies based on the strangers' speech patterns.

He was Candar, the most intelligent, talented and dangerous single entity in the universe; and all he had to do was wait.

The standard intercom speakers fitted in geodesic survey modules were, in spite of their small size, very good. Surgenor had never heard one overloaded before, but immediately following Aseop's announcement effective communication was lost in a crashing, skidding roar as every module reacted in surprise or disbelief. A defense mechanism caused him to stare at the speaker grill in mild wonderment while another part of his mind assimilated Aesop's news.

A seventh module had appeared on an airless world which was not only uninhabited but, in the strictest clinical sense of the word, sterile. Not even the toughest known virus could survive when Prila I ran the gamut of its double sun. The cacophony from the speaker quieted abruptly as Aesop came on the air again.

"I am open for suggestions regarding our next move, but they must be made one at a time."

The hint of reproof in Aesop's voice was enough to damp the noise level to a background rumble, but Surgenor could sense a growing panic. The trouble was that operating a geodesic survey module had never become a profession—it was too easy. It was a big-money job that smart young men went into for two or three years to raise capital for business ventures, and when signing on they practically demanded a written guarantee that there never would be any interruption in the profitable routine. Now something had gone wrong and they were worried.

Surgenor felt a flicker of anger at his teammates, then remembered that he, too, was getting out. He had joined up seventeen years before, along with two of his space-struck cousins—they stayed for eight years before quitting and going into the plant-hire business. Most of his accumulated salary was in the business with them, but now Carl and Chris had reached the end of their patience. He had to take an active part in running the firm or be bought out, which was why he had served notice of resignation. At the age of thirty-six he was going to settle down to a normal life, do a little fishing and golfing, and probably get married. Surgenor had to admit the prospect was not unpleasant. It was a pity that *Module Seven* had had to crop up on his last trip.

"If there is a seventh module, Aesop," Gillespie in *Three* spoke quickly, "another survey ship must

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have been here before us. Perhaps an emergency landing."

"No," Captain Aesop replied. "The detectors rule that possibility right out. Besides we are the only scheduled crew within three hundred light-years."

Surgenor pressed his Talk button. "Have you checked for some kind of underground installation?"

"The world map is not yet complete but I have run a computer check on all the geognostic data. Result negative."

Gillespie in *Three* spoke again. "I take it that this new module hasn't tried to communicate with the *Sarafand* or with any of the crews. Why is that?"

"I can only surmise it is deliberately mingling with the others to get near the ship. At this stage I can't say why, but I don't like it."

"Well, what do we do?" The question was asked simultaneously by several men.

There was a long silence before Aesop spoke. "I ordered all modules to halt because I do not wish to risk losing the ship, but I realize now that a certain amount of risk must be taken. I can see only three modules and because the search pattern was broken over the last two hundred miles I cannot identify any of you by compass bearing. I will permit all modules to approach the ship to a distance of one thousand yards for visual inspection. Any module attempting to come closer will be destroyed. No warnings will be issued. Commence your approach now."

When *Module Five* drew to a halt a thousand yards from the *Sarafand* the only sign of other vehicles was one distantly wavering light on the plain beyond the big ship. Surgenor watched the light draw near wondering if it was—he hesitated, then applied the label—the enemy.

"I wonder is that it," Voysey said.

"Who knows?" Surgenor replied. "Why don't you ask it?"

Voysey sat motionless for several seconds "All right. I will." He pressed his Talk button. "This is *Module Five,* Voysey speaking. We are already at the ship. Who is the second module now approaching?"

"*Module One,* Lamereux speaking," came a hearteningly familiar voice. "Hello, Victor, Dave. Good to see you—that's if it *is* you."

"Of course. Who do you think it is?"

Lamereux's laugh sounded slightly unnatural. "At a time like this I wouldn't even like to guess."

Voysey jabbed down on his Talk button, then changed his mind. "I hope Aesop spots a difference and blows this *Seven* to shreds without any talk. Before it makes a move."

"What if it doesn't make a move? It might be happy to do nothing but mix us up." Surgenor unwrapped a sandwich and bit into it—he had planned that his next meal would be

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a steak on board the mother ship, but it looked as though dinner might be a little late.

"What do you mean about not making a move?"

"Well, even on Earth there are birds that imitate men's voices, monkeys that mimic their actions—and they haven't any special reason for doing it. That's just the way they are. This thing might be a supermimic. Maybe it just turns into the same shape as any new thing it sees without even wanting to."

"An animal that can mimic a forty-foot long machine? I believed you about the Drambons, Dave, but this is too much."

Surgenor shrugged and ate more sandwich. He had seen the Drambons on his hundred and twenty-third survey, wheel-shaped creatures on a high-gravity planet who were the opposite of humans and most other beings in that their blood remained stationary at the bottom of the wheel while their bodies circulated. He always had trouble convincing new survey men that Drambons really existed—Drambons and a hundred other equally weird species. That was the trouble with the Instant Distance drive—it was the first form of travel which didn't broaden the mind. Voysey was five thousand light-years from Earth, but because he hadn't done it the hard way, hopping from star to lonely star, he was mentally still inside the orbit of Mars.

Slowly the other vehicles made their appearances on *Module Five*'s viewscreen until there were seven ranged in a circle around the black pinnacle of the *Sarafand*. Captain Aesop had remained silent during the approach maneuvers, but comment from the various crews crashed continuously from the radio grill. Some of the men, finding themselves still alive and unharmed as minute after minute went by, began to relax and make jokes. The jokes died away as Aesop finally spoke from the lofty security of the ship's operations level, two hundred feet above the surface of the plain.

"Before we listen to such suggestions as may be available," he said calmly, "I wish to remind all crews of the standing order not to approach the ship to within one thousand yards. Any module doing so will be destroyed without further warning. You may now," Aesop concluded pleasantly, "proceed with the discussion."

Voysey snorted with resentment. "Coffee and cucumber sandwiches will be served presently! When I get back on board I'm going to take a fourteen-pound hammer to Aesop and smash his . . . He just doesn't *care*."

"Aesop does care," Surgenor said "He simply isn't demonstrative."

The confident, reedy voice of Pollen in *Module Four* was the first to break the radio silence that

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had followed Aesop's announcement. This was Pollen's eleventh survey and he was writing a book about his experiences, but had never allowed Surgenor to see the manuscript. Surgenor suspected that it was because he, Surgenor, appeared in it as a laughable Oldest-Member figure.

"To me, the problem we have here," Pollen began, "appears to take the form of a classical exercise in logic."

"Turn it off, Pollen," somebody interrupted angrily.

"All right, all right. But the fact remains that we can think our way out of this one. The basic parameters of the problem are these: We have six unmarked and identical survey modules and, hidden among them, a seventh machine . . ."

Surgenor pressed his Talk button. "Correction," he said quietly.

"Was that Dave Surgenor?" Pollen said. "As I was saying, there is a seventh machine . . ."

"Correction."

"That *is* Surgenor, isn't it? What do you want, Dave?"

"I just want to help you be logical, Clifford. There isn't a seventh machine—we've got six machines and a very special sort of animal."

"An animal?"

"Yes. It's a Gray Man."

For the second time in an hour, Surgenor heard his radio fail to cope with the demands made on it, and he waited impassively for the noise to subside. He glanced sideways at Voysey's exasperated face and wondered if he, too, had looked like that the first time he had heard. The stories were not widespread, but here and there they cropped up, on worlds where the native racial memory reached far enough into the past. There were distortions upon distortions, but always the theme of the Gray Men and the battle they had waged with and lost to the White Ones. Neither race had left any tangible traces of its existence to be picked up by Earth's belated armies of archaeologists, but the myths were still there. And the most significant thing, to one whose ears were in tune, was that—no matter what the shape of the storytellers or whether they walked, swam, flew, crawled or burrowed—the name they applied to the Gray Men was always their own name for members of their own species . . .

"What's a Gray Man?" It was Carlen in *Two*.

"It's a big gray monster that can turn itself into anything it wants," Pollen explained. "Surgenor never travels anywhere without his. He's had it all over the galaxy—that's what started all those old stories."

"It can't turn itself into anything it wants," Surgenor said. "It can only assume any external shape it wants. Inside it's still a Gray Man." There was another roar of disbelief in which Surgenor distinguished the words "Ancient Mariner" several times. "All right," he said with delib-

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erate and typical stolidity. The best way to convince Pollen was to let him convince himself. "You don't have to accept my word, Clifford."

"I know, Dave—the Gray Man will vouch for everything you say!"

"Ask Captain Aesop to go through the xenological data stores and estimate the probability of the existence of the Gray Men in the first place, and also the probability that *Module Seven* is a Gray Man." Surgenor noticed that this time there was no laughter and was relieved because, if he was right there was no time for irrelevancies. In fact, there was probably no time at all. The bright double star, which was this world's parent sun, was hanging low in the sky beyond the dim bulk of the *Sarafand* and the distant black hills. In another seventeen months the planet would be threading its way between those two points of light and Surgenor wanted to be far away when that happened—but so did the multi-talented super beast hidden in their midst.

Candar was astonished to find himself listening to the food creatures' mental processes with something approaching interest.

His race had never been machine-builders—they had relied instead on the strength, speed and adaptability of their great gray bodies. On top of this instinctive disregard for machinery, Candar had spent seventy centuries on a world where no artifact, no matter how well constructed, could survive the annual passage through the binary hell. Consequently he was shocked to realize how much the food creatures depended on their fabrications of metal and plastics. The discovery which most intrigued him was that the metal shells were not only a means of transport, but they actually supported the lives of the food creatures while they were on this airless world.

Candar tried to imagine entrusting his life to the care of a complicated and fallible mechanism, but the idea filled him with a vast, unfamiliar dread. He pushed it aside and concentrated all his ferocious intelligence on the problem of getting close enough to the spaceship to seize the minds within. In particular, it was necessary to immobilize the one they called Captain Aesop before the ship's weapons could be brought into play.

Gently, delicately, controlling his hunger, Candar prepared the attack.

Surgenor stared at his hand in disbelief.

He had decided to drink some coffee to ease the dryness in his throat and had begun to reach for the supply tube. His right hand had risen perhaps an eighth of an inch then had dropped back on to the armrest.

Surgenor's instinctive reaction was to bring his left hand over to assist the other, but it, too, refused

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to move—and the realization came that he was paralyzed.

The mindless period of panic lasted perhaps a full minute, at the end of which Surgenor found himself exhausted from the conflict with his locked muscles. Serpents of icy sweat were making savage downward rushes over every part of his body. He forced himself to relax and assess the situation, discovering as he did so that he still had control of his eye movements.

A sideways glance showed him that Voysey had been caught, too; the only sign of life being a barely perceptible tremor of the facial muscles. Surgenor guessed the phenomenon was new to Voysey. It was the first time Surgenor had ever experienced it at first hand, but he had been on many worlds where animals of prey were able to surround themselves with a blanket field capable of suppressing the grosser neural activities in other creatures. The deadly talent was most often encountered on high gravity planets whose predators were likely to be as sluggish as their victims. Surgenor tried to speak to Voysey but, as he had expected, was unable to direct air through his vocal chords.

He suddenly became aware that voices were still issuing from the communication speaker, and listened for a while before the full significance of the fact dawned on him.

"There isn't much to worry about," Pollen was saying. "This is the sort of exercise in pure logic which is right up your street, Aesop. I would suggest that you lead off by calling out the module numbers in rotation and commanding each to move back a hundred yards. In that way the original six machines will be separated from the seventh, or on one of the commands *two* machines will . . ."

Surgenor swore mentally at his inability to reach his Talk button and cut Pollen off before it was too late, but then the other man's voice was lost in a shrill, discordant whistle of interference. The noise continued with no sign of abating and Surgenor knew with a pang of relief, that *Module Seven* had stepped in. Surgenor tried to relax and found himself thinking clearly. Pollen had been loudly and confidently signing their death warrants by making the, in this case fatal, mistake of confusing the map with the territory.

The situation on the black airless plain glimmering in the viewscreens bore a superficial resemblance to the classical identification problem, and treated on that level Surgenor could see several solutions. Apart from Pollen's standard juggling-with-numbers technique, a more empirical approach would be to have Aesop fire a low-powered burst from a laser rifle at each module in turn. Even if a Gray Man were able to withstand that sort of treatment without flinching, spectroscopic analysis of the light produced would

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show up compositional differences. Another solution would be to order each module to unship its little inspection-and-repair robot. Surgenor doubted if the alien could cope with a simulation task which involved splitting itself in two.

The deadly flaw in all those solutions was that they employed a process of *elimination*—which was something *Module Seven* would never permit. Any attempt to narrow down the field would only trigger off the final calamity a little earlier. The real-life solution, if one existed, must be capable of instantaneous application, and Surgenor was not at all optimistic about his chances of finding it.

From sheer force of habit he began reviewing the situation, processing his data, then realized the significance of the voices from the communication speaker. Pollen and several others were still able to talk, which probably meant they were out of *Module Seven*'s range.

The discovery gave him a momentary lift and Surgenor examined the viewscreens, wondering just how many minutes, or seconds, were left. It was difficult to assimilate the discreet images properly, but he saw that there were two modules not far away to the right, which meant that his own vehicle was part of a loose cluster of three. All the others were much farther away on the opposite side of the circle and as he watched one of them began flashing its lights in a hesitant attempt at Morse. Surgenor ignored it, partly because he had long forgotten the code and partly because he was concentrating on the two nearer machines, one of which would be *Module Seven*. High up on the *Sarafand* lights flickered against the background of stars as Aesop responded in crisp, high-speed Morse. Surgenor almost wanted to laugh—trust Aesop to have the ancient code down pat.

The continuing screech of radio interference was making thought difficult but Surgenor kept doggedly at it. At first he was not sure why it was worth the trouble, then the dim outlines of an incredible idea began to emerge. There seemed to be something inconsistent about . . .

Voysey moved his right hand forward to the control console and started the engines.

For an instant Surgenor thought they had been freed but he found himself still unable to move. Voysey's face was chalk-white and immobile, saliva glistening on his chin, and Surgenor realized he had acted merely as a human servomechanism, controlled by *Module Seven*. Surgenor's mind began to race. This must be it then, he thought, the big moment. The only reason the alien could have for making Voysey activate the motors was that it was planning to move the vehicle to create a distraction for Aesop. Surgenor went numb at the idea—Aesop was not easily distracted, nor

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would he have any hesitation in vaporizing the first module to cross the invisible thousand-yard line.

Voysey's left hand released the brakes and the vehicle shifted slightly on the uneven ground.

Surgenor made another frantic useless effort to move. But what was *Module Seven*'s plan? Its radius of control was limited and it was about to create a diversion, which implied that it was going to get closer to the *Sarafand*. But that meant . . .

The truth seemed to bathe Surgenor's mind in an almost physical brilliance, then new vistas of danger unfolded. I know the truth, he thought, but I mustn't think about it because a Gray Man is telepathic and if I think about it . . .

Voysey's hand thrust hard against the throttle levers and the module dipped forward.

. . . The Gray Man will know that—No, think about anything else, think about the champagne I'm not going to taste ever again; think about the Drambons rolling in their self-contained pools of blood; but don't think about . . . I almost did it . . . I almost thought about . . . I can't help it . . . AESOP!

The distance separating Candar from the spaceship was one that, in a more efficient form, he could have crossed in two bounds. It would take slightly longer this way, but he knew he was too fast to be stopped by anything. He gave full rein to his hunger, letting it drive him on as he leaped forward. Behind him, rather slower than he had expected, the two machines he had taken under control rolled towards the spaceship. One of the food creatures was *vainly trying to suppress a thought* but there was no time to study its meaning. Changing shape as he went, Candar got safely within control distance and exultantly struck with his brain into the spaceship.

Nothing!

An ultralaser beam hit him with a violence which would have destroyed any other creature in a matter of microseconds, but Candar could not die so easily. The pain was greater than he could ever have expected, but even worse than the agony was his sudden clear look into the minds of the food creatures —those bleak, cold, alien minds.

For the first time ever, Candar felt fear.

Then he died.

The champagne was good, the steak was good, and sleep—when it finally came—would be even better.

Surgenor leaned back contentedly, lit his pipe, and gazed benignly at the group round the table on the Sarafand's operations level. During the meal he had reached a decision, and he knew with a comforting glow in his belly that, for him, it was the right decision. He had made up his mind that he *liked* being an Oldest Member figure. Smart young men could go on putting him in their

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books, his cousins could buy him out of their plant-hire business—he was going to stay with the Cartographical Service until he dropped. It was his life, and he wasn't giving it up.

At the other end of the table, Pollen was making out his notes of the trip.

"The way you see it then, Dave," Pollen said, "is that the Gray Man was simply incapable of understanding the machine building philosophy?"

"That's right. A Gray Man, because of his special physical properties, would have no use for a machine at the best of times. And thousands of years on a planet like Prila I—where a machine couldn't exist anyway—would have conditioned his mind to the point where our machine-orientated lives would have been incomprehensible to him."

Surgenor drew on the fragrant smoke and looked out through the viewscreens to where the brilliant double star hung low in the sky, and he felt an unexpected surge of sympathy for the massive alien being whose remains still lay on the black rock of the plain. Life would have been very precious to a Gray Man, too precious for him ever to consider entrusting it to anyone or anything but himself. That, basically, was why he had made the mistake of trying to control the entity the *Sarafand*'s crew thought of as Captain Aesop.

Wondering how the Gray Man had felt in that last moment of discovery, Surgenor glanced at the discreet identification plate on the ship's central computing installation—that vast artificial intelligence into whose keeping they delivered their lives at the beginning of each survey. The plate said:

A. E. S. O. P.

Surgenor had heard the crewmen guess that the letters stood for Automatic Electronic Spaceship Operating Plant—but nobody was absolutely sure. Human beings, he suddenly realized, tend to take a lot for granted. ■

THE ANALYTICAL LABORATORY/MAY 1968

PLACE	STORY	AUTHOR	POINTS
1.	Satan's World (Pt. 1)	*Poul Anderson*	1.89
2.	Fear Hound	*Katherine MacLean*	3.42
3.	Conquest by Default	*Vernor Vinge*	3.54
4.	His Master's Voice	*Verge Foray*	3.83
5.	Skysign	*James Blish*	4.50

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Poul Anderson

SATAN'S WORLD

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Conclusion. That strategy, wiles, and wily maneuvers are effective is beyond doubt—but there are times, on Satan's World or any other, that sheer violent force is the necessary tactic. For that, someone like Adzel came in handy . . .

Illustrated by Kelly Freas

SYNOPSIS

The Polesotechnic League is theoretically just a mutual-benefit organization of interstellar companies. In practice—given the scale of its operation and the spread of laissez-faire economics—it represents a kind of super-feudalism. Its members act like nearly independent barons, dealing with entire governments on the planets, sometimes making or breaking them, dominating even the powerful nations of the Solar Commonwealth. But the League has its own problems and limitations. Space is too huge; there are too many worlds. Several score light-years from Sol begin those regions which are almost entirely unexplored. Closer in, exploration and development are still incomplete. The sheer volume of data makes it impossible to understand the total situation at any given time, or to lay rational plans for the future.

A new enterprise, Serendipity, Inc., offers a partial solution. Its computers, advanced in this respect beyond any other known machines, do more than collect and correlate information. They search their memory banks along association chains beginning with a particular client or problem, somewhat as a living brain does but with vastly greater scope. Thus many a datum, recorded but then forgotten, is found to be useful to someone. Naturally, the highly competitive merchant princes of the League are suspicious at first of an outfit which sets up to buy and sell information. But Serendipity soon proves that it favors no one, keeps the secrets entrusted to it, and renders an invaluable service. Over the years, it grows immensely. This despite the fact that the six founder-partners, though human, are of unknown background and keep strictly to themselves. Technic civilization has a high regard for privacy, and eccentrics are common.

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David Falkayn, born on the autonomous colony planet Hermes, takes a vacation in the Solar System. While there, he decides to visit Serendipity's office in Lunograd on the Moon, and see if it can turn up anything for him. He is a trade pioneer for Nicholas van Rijn's Solar Spice & Liquors Company. His job is to discover new sources and new markets in space, which can then be quietly exploited before the competition learns about them. But through various exploits, he has become somewhat prominent. A girl who calls herself Veronica has latched onto him. He can tell that she is a commercial spy, out to learn what she can about van Rijn's operations so that the rivals of the latter can get the jump on him. Such attempts are taken for granted, along with bribery, blackmail, burglary, and much else. Falkayn isn't worried. Competition is not literally cutthroat; it is regulated by the covenant of the League so as to protect the psychobiological integrity of the individual, hence ruling out procedures like murder, kidnapping, and brainscrub. Enjoying Veronica's company, Falkayn simply jollies her along, and leaves her behind when he goes to Serendipity, Inc.

There he talks to Thea Beldaniel, one of the owners. She leads him to an isolation room where he consults a computer. The machine associates him with his discovery, some years ago, of planets freakishly captured by a blue giant star. No other case has ever been found. But nonhuman explorers did come upon one analogous oddity. A sunless "rogue" planet is approaching the B-type star Beta Crucis, some two hundred light-years hence. It will pass by in a tight hyperbolic orbit and recede into space. The explorers saw no significance in this cosmic accident, and their report never reached the Solar System until the ceaseless information-gathering activity of SI chanced to net it. Even then, the machine did not "think" of the matter until Falkayn's presence "reminded" it. Now it suggests that here may be the greatest bonanza in galactic history. Absolute secrecy should be preserved. Falkayn agrees.

Emerging, he finds Thea Beldaniel friendlier than before. She invites him to visit her and her partners in their Lunar Alpine castle, to discuss a mutually profitable idea. Since no one but nonhuman guards and servants has ever been there before, and since the cenobitical owners of SI may change their minds at any moment, Falkayn leaps at the opportunity to learn something more about their by now key operation. He postpones doing anything about the rogue planet and goes straight from Lunograd, stopping only to notify the other members of his trade team.

These are nonhuman themselves: the small, quick, short-tempered Cynthian xenobiologist Chee Lan,

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and the gigantic, placid, dragonlike planetologist Adzel from Woden. They fret a little at the delay, but not too much. Veronica frets more, since Falkayn has stood her up; her interest in him has become personal rather than professional.

At the castle, Falkayn meets three other SI stockholders: Kim Yoon-Kun, Anastasia Herrera, and the wife of Hugh Latimer. Latimer himself, and Thea Beldaniel's sister, are absent "on business." Though his hosts try to prevent it, he sees the lift-off of an interstellar ship that he is certain contains those two. It becomes plain that he was invited here simply to get him out of the way while something else happens. Thea tries to allay his suspicions with a story about the background of her group—their shipwreck as children, their adoption by kindly nonhumans who want to stay outside of Technic civilization but who did send them back with a grubstake of rare metals and later supplied them with computer parts. This only makes Falkayn warier. When he declares that he will leave, he is taken prisoner.

Chee Lan and Adzel try repeatedly to call him in the following days. At last they are granted an audiovisual contact. Falkayn tells them he is quitting Solar S & L, joining SI, and marrying Thea. His comrades are convinced that he has been made a puppet by brainscrub techniques. Getting no satisfaction from the Lunar police—who much favor well-behaved SI over the rowdy remainder of the League—they appeal to Nicholas van Rijn. He agrees that Falkayn probably is controlled. Formal action will take too long to organize. A rescue mission, therefore, will be extremely illegal. Van Rijn can stall off the authorities for a whi'e. But Chee and Adzel must risk their lives and liberty to get their friend back.

Using their fast, well-armed exploratory ship Muddlin' Through, *they succeed. Adzel breaks in and seizes Falkayn, then Chee pulls both of them out. In the course of the raid, several castle guards are killed. Van Rijn orders Chee to take Falkayn away into space. She can cure him with equipment already loaded aboard, and go investigate whatever it was he learned at SI. Clearly his supposedly private conference with the computer there was spied on, and the facts revealed were so tremendous as to force SI into actions that the League would never tolerate. Doubtless the information brokers have been spies all along for some unidentified but hostile power. Latimer and Thea's sister are known to have left the Solar System, surely to carry word to their masters. Speed is vital.*

Adzel has gathered proof that Falkayn was indeed brainscrubbed. Van Rijn does not show it to the police. Instead, he lets Adzel be arrested. Meanwhile he uses the evidence to bargain with the SI owners still in Lunograd. He forces

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them to sell their holdings to a trustworthy group—paying him a fat commission—and assist in concocting a story which gets Adzel freed. All but Thea promptly leave. She remains, to help negotiate the sale and later guide van Rijn to a rendezvous. There, on the advice of her associates, her masters may or may not come parley with him. He agrees to preserve secrecy for the time being; he doesn't trust any government, or the League as a whole, to deal with a situation as dangerous as this, at least not until it has been made less obscure.

Restored, but deeply embittered by his experience, Falkayn arrives with Chee Lan at Beta Crucis. They find the rogue planet. It is approaching periastron. Under the rays of the blue giant, its cryosphere is boiling into gas and water. Conditions are so chaotic and hazardous that Falkayn names it Satan; and violence waxes hourly. After gathering and integrating a vast amount of data in orbit, Muddlehead—the ship's computer "brain"—does manage to land. This will soon be impossible because of storms, and remain that way for years, until the planet has moved far back toward interstellar space.

Nonetheless, Satan is potentially of fabulous worth: as a site for the large-scale industrial synthesis of rare isotopes. Having verified that, Falkayn and Chee are about ready to go home. Then Muddlehead detects a sizable flotilla of spaceships, coming in fast from the unexplored Circinus region.

They must belong to SI's masters, responding to Latimer's report. It seems unlikely that Muddlin' Through *can either hide until they leave, or outrun them once she herself is detected. But her hyperdrive "wake" can cover that of a message capsule, sent back toward Sol with an account of what has hitherto been learned. Falkayn and Chee dispatch such a one, and go on out to meet the strangers.*

The ships are indeed of a design unknown throughout Technic civilization, incredibly heavily armed, but moving in a formation and at a speed which look reckless. Furthermore, they must have come here straight from base, without sending so much as a scout ahead. What kind of society would make that kind of commitment, sight unseen?

Contact is established with Latimer, who is aboard the flagship. He has not met Falkayn, and the latter uses a false identity. Latimer says his Lord Gahood commands Falkayn to join them for discussions. When Falkayn tries to set conditions, Latimer grows alarmed. He warns that Gahood is easily angered —and, by implication, supremely self-confident and arrogant. Falkayn bluffs about having reinforcements waiting near Satan, but doubts if he is taken seriously. He is sickly aware that he could be captured and brain-scrubbed again; death would be better. But then he realizes that, if he

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carries a primed grenade, he need suffer no worse than death, and might take some enemies with him.

Approaching the flotilla in grav-sled, and boarding the giant battleship, he deduces that Latimer and the Shenn, Gahood, are the only living beings there. The vessels are entirely robotic. Gahood is a great, minotaurlike creature, living in surroundings that look at once barbaric and decadent. He appears to be some kind of patriarchal overlord, among others, on his home world of Dathyna. How could a culture like his have developed cybernetics to this fantastic extent? How could personalities so rash and brutal have patiently created an organization like Serendipity? Why have the Shenna kept their existence unknown to Technic planets while spying upon them?

Gahood soon loses patience and tries to have Falkayn killed by a robot. He himself is sheltered from the grenade. But Falkayn gets behind the barrier with Latimer and thus turns the tables. He cannot capture Gahood, but he can take Latimer back with him as a hostage. Under the circumstances, and infuriated as he is, he does not scruple to break that bargain. He makes Latiner a prisoner and starts for Satan while Gahood's robots retrieve an empty spacesuit. Chee interrogates Latimer under drugs as Muddlin' Through *flees. Falkayn lures the bulk of the Shenn flotilla down into the atmosphere of Satan. Lacking Muddlehead's knowledge of Satan's climate, they are destroyed, and the League craft attacks the rest. None escape but Gahood's ship and another. Those beat a retreat, presumably back toward Dathyna.*

Latimer reveals the location of that world, then dies. Falkayn did not intend this; he did not know the man was under mortal stress from the psychoconditioning given him. There is no time to feel sorry. Muddlin' Through *must report to Earth. He suddenly realizes she can't!*

Meanwhile van Rijn has been negotiating with Thea Beldaniel. On the side, he has done what he can to make both the League and the various governments ready for trouble. Given so many elements in the situation, both known and unknown, he dares not risk the unpredictable consequences of telling everything he has learned. (This includes the existence of the rogue planet—on which he wants a monopoly.) But he chicanes the powers that be into the preliminaries of mobilization; and he leaves a full account behind, to be opened if he does not return.

Thea prevents further preparation by insisting he leave with her for rendezvous now or not at all. They will travel on a ship fresh from an extraterrestrial yard, so that he cannot plant tracing devices, and she will inform him of their destination when they are outside the Solar System. She does allow him Adzel for a companion. The three depart.

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Part 4

XIX

The ship went under hyperdrive and raced through night. She would take about three weeks to reach her destination.

In the beginning Thea held aloof, stayed mainly in her cabin, said little beyond the formulas of courtesy at mealtimes and chance encounters. Van Rijn did not press her. But he talked at the table, first over the food and afterward over large bottles of wine and brandy. It sounded like idle talk, reminiscence, free association, genial for the most part though occasionally serious. Remarks of Adzel's often prompted these monologues; nonetheless, van Rijn seemed to take for granted that he was addressing the thin, jittery, never-smiling woman as well as the mild-mannered draco-centauroid.

She excused herself immediately after the first few meals. But soon she stayed, listening till all hours. There was really nothing else to do; and a multiple billion light-years of loneliness enclosed this thrumming metal shell; and van Rijn's tongue rambled through much that had never been public knowledge, the stuff of both science and saga.

". . . We could not come near that white dwarf star, so bad did it radiate . . . *ja,* hard X-ray quanta jumping off it like fleas abandoning a sinking dog . . . only somehow we had got to recover the derelict or our poor little new company would be bankruptured. Well, I thought, fate had harpooned me in the end. But by damn, the notion about a harpoon made me think maybe we could . . ."

What she did not know was that Adzel received his instructions prior to each such occasion. What he was to say, ask, object to, and confirm was listed for him. Thus van Rijn had a series of precisely planned conversations to try on Thea Beldaniel.

He soon developed a pretty good general idea of what subjects interested and pleased her, what bored or repelled. No doubt she was storing away in memory everything that might possibly be useful to the Shenna. But she must recognize that usefulness was marginal, especially when she had no way of telling how much truth lay in any given anecdote. It followed that her reaction to whatever he told her came chiefly from her own personality, her own emotions. Even more self-revealing were her reactions to the various styles he used. A story might be related in a cold, impersonal, calculating manner; or with barbaric glee; or humorously; or philosophically; or tenderly; or poetically, when he put words in the mouth of someone else; or in any number of other ways. Of course, he did not spring from one method straight to another. He tried different proportions.

The voyage was not half over

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when he had learned what face to adopt for her. Thereafter he concentrated on it. Adzel was no longer needed. She responded directly, eagerly to the man.

They were enemies yet. But he had become a respected opponent —or more than respected—and the hope was pathetic to see growing in her, that peace might be made between him and her lords.

"Natural, I want peace myself," he boomed benevolently. "What we got to fight for? Two or three hundred billion stars in our galaxy. Plenty room, *nie?*" He gestured at Adzel, who, well-rehearsed, trotted off to fetch more cognac. When it arrived, he mad a fuss— "Wa-a-agh! Not fit for pouring in burnt-out chemosensors, this, let alone our lady friend what don't drink a lot and keeps a fine palate. Take it back and bring me another what better be decent! No, don't toss it out neither! You got scales on your brain like on your carcass? We take this home and show it to the dealer and make him consume it in a most unlikely way!"—although it was a perfectly good bottle which he and the Wodenite would later share in private. The act was part of the effect he was creating. Jove must loose occasional thunders and lightnings.

"Why is your Shenna scared of us?" he asked another time.

Thea bristled. "They are not! Nothing frightens them!" (Yes, they must be Jove and she their worshiper. At least to a first approximation. There were hints that the relationship was actually more subtle, and involved a master-figure which was actually more primitive.) "They were being careful . . . discreet . . . wise . . . to study you b-b-beforehand."

"So, so, so. Don't get angry, please. How can I say right things about them when you won't tell me none?"

"I can't." She gulped. Her hands twisted together. "I mustn't." She fled to her cabin.

Presently van Rijn followed. He could drift along like smoke when he chose. Her door was shut and massive; but he had worn a button in his ear, hidden by the ringlets, when he embarked. It was a transistorized sound amplifier, patterned after hearing aids from the period before regenerative techniques were developed. He listened to her sobs for a while, neither bashfully nor gloatingly. They confirmed that he had her in psychological retreat. She would not surrender, not in the mere days of travel which remained. But she would give ground, if he advanced with care.

He jollied her, the next watch they met. And at the following supper, he proceeded to get her a little drunk over dessert. Adzel left quietly and spent half an hour at the main control board, adjusting the color and intensity of the saloon lights. They became a roman-

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tic glow too gradually for Thea to notice. Van Rijn had openly brought a player and installed it that they might enjoy dinner music. "Tonight's" program ran through a calculated gamut of pieces like "The Last Spring," "La, Ci Darem La Mano," "Isoldes Liebestod," "Londonderry Air," "Evenstar Blues." He did not identify them for her. Poor creature, she was too alienated from her own people for the names to mean anything. But they should have their own influence.

He had no physical designs on her. (Not that he would have minded. She was, if not beautiful, if far less well filled out than he liked, rather attractive—despite her severe white suit—now that she had relaxed. Interest turned her finely boned features vivid and kindled those really beautiful green eyes. When she spoke with a smile, and with no purpose except the pleasure of speaking to a fellow human, her voice grew husky.) Any such attempt would have triggered her defenses. He was trying for a more rarefied, and vital, kind of seduction.

". . . They raised us," she said dreamily. "Oh, I know the Earthside jargon. I know it gave us deviant personalities. But what is the norm, honestly, Nicholas? We're different from other humans, true. But human nature is plastic. I don't believe you can call us warped, any more than you yourself are because you were brought up in a particular tradition. We are healthy and happy."

Van Rijn raised one eyebrow.

"We are!" she said louder, sitting erect again. "We're glad and proud to serve our . . . our saviors."

" 'The lady doth protest too much, methinks,' " he murmured.

"What?"

"A line in Old Anglic. You would not recognize. Pronunciation has changed. It means I am very interested. You never told nobody about your background before, the shipwreck and all."

"Well, I did tell Davy Falkayn . . . when he was with us—" Tears gleamed suddenly on her lashes. She squeezed the lids together, shook her head, and drained her glass. Van Rijn refilled it.

"He's a sweet young man," she said fast. "I never wanted to harm him. None of us did. Not our fault he was, was, was sent off to danger. By you! I do hope he'll be lucky."

Van Rijn did not pursue the point she had inadvertently verified: that Latimer and her sister had carried word to the Shenna, who would promptly have organized a Beta Crucis expedition of their own. It was a rather obvious point. Instead, he drawled:

"If he was a friend like you say, you must have hurt when you lied to him."

"I don't know what you mean." She looked shocked.

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"You spun him one synthetic yarn, you." Van Rijn's mild tone took the edge off his words. "That radiation accident, and you getting found later, is too big, spiky a coincidence for me to swallow. Also, if the Shenna only wanted to return you home, with a stake, they would not set you up for spies. Also, you is too well trained, too loyal, for being raised by utter aliens from adolescence. You might have been grateful to them for their help, but you would not be their agents against your own race what never harmed you—not unless you was raised from pups. No, they got you sooner in life than you tell. *Nie?*"

"Well—"

"Don't get mad." Van Rijn raised his own glass and contemplated the colors within. "I am simpleminded, good-hearted trying to come at some understandings, so I can figure how we settle this trouble and not have any fights. I don't ask you should pass out no real secrets from the Shenna. But things like, oh, what they call their home planet—"

"Dathyna," she whispered.

"Ah. See? That did not hurt you nor them for saying, did it? And makes our talking a lot handier, we don't need circumlocomotions. Hokay, you was raised from babies, for a purpose, as might be because the Shenna wanted special ambassadors. Why not admit it? How you was raised, what the environment was like, every little friendly datum helps me understand you and your people, Thea."

"I can't tell you anything important."

"I know. Like the kind of sun Dathyna got is maybe too good a clue. But how about the kind of living? Was your childhood happy?"

"Yes. Yes. My earliest memory is . . . Isthayan, one of my master's sons, took me exploring . . . he wanted someone to carry his weapons, even their toddlers have weapons. We went out of the household, into the ruined part of that huge old, old building . . . we found some machinery in a high tower room, it hadn't rusted much, the sunlight struck through a hole in the roof like white fire, off metal, and I laughed to see it shine . . . We could look out, across the desert, like forever—" Her eyes widened. She laid a hand across her lips. "No. I'm talking far too freely. I'd better say good night."

"Verweile doch, du bist so schon," van Rijn said, "what is another old Earth quotation and means stay a while and have some Madeira, my dear. We discuss safe things. For instance, if you babies didn't come off no colonizer ship, then where?"

The color left her cheeks. "Goodnight!" she gasped, and once again she ran. By now he could have shouted an order to stay and she would have heeded; for the reflex of obedience to that kind of

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stimulus had become plain to see in her. He refrained, though. Interrogation would only produce hysteria.

Instead, when he and Adzel were alone in the Wodenite's stateroom —which had been prepared by ripping out the bulkhead between two adjoining ones—he rumbled around a nightcap:

"I got a few information bits from her. Clues to what kind of world and culture we is colliding with. More about the psychologics than the outside facts. But that could be helpful, too." His moustaches rose with the violence of his grimace. "Because what we face is not just troublesome, it is nasty. Horrible."

"What have you learned, then?" the other asked calmly.

"Obvious, the Shenna made slaves—no, dogs—out of humans on purpose that they got from babies. Maybe other sophonts, too—but anyways humans."

"Where did they obtain the infants?"

"I got no proof, but here is a better guess than Beldaniel and her partners maybe thought I could make. Look, we can assume pretty safe the rendezvous planet we is bound for is fairly near Dathyna so they got the advantage of short communications while we is far from home and our nice friends with guns. Right?"

Adzel rubbed his head, a bony sound. " 'Near' is a relative term. Within a sphere of fifty or a hundred light-years' radius there are so many stars that we have no reasonable chance of locating the centrum of our opponents before they have mounted whatever operation they intend."

"*Ja, ja, ja.* What I mean is, though, somewhere around where we aim at is territory where Shenna been active for a longish while. Hokay? Well, happens I remember, about fifty years back was an attempt for planting a human colony out this way. A little utopian group like was common in those days. Late type G star, but had one not bad planet what they called, uh, *ja,* Leandra. They wanted to get away from anybody interrupting their paradise. And they was successful. No profit for traveling that far to trade. They had one ship for their own what would visit Ifri or Llynathawr maybe once a year and buy things they found they needed, for money they had along. Finally was a long time with no ship. Somebody got worried and went to see. Leandra stood abandoned. The single village was pretty burnt—had been a forest fire over everywhere for kilometers around—but the ship was gone. Made a big mystery for a while. I heard about it because happened I was traveling by Ifri some years afterward. Of course, it made no splash on Earth or any important planet."

"Did no one think of piracy?" Adzel asked.

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"Oh, probable. But why should pirates sack a tiny place like that? Besides, had been no later attacks. Who ever heard of one-shot pirates? Logical theory was, fire wiped out croplands, warehouses, everything the Leandrans needed to live. They went after help, all in their ship, had troubles in space and never made port. The matter is pretty well forgot now. I don't believe nobody has bothered with Leandra since. Too many better places closer to home." Van Rijn scowled at his glass as if it were another enemy. "Tonight I guess different. Could be Shenna work. They could of first landed, like friendly explorers from a world what lately begun space travel. They could learn details and figure what to do. Then they could kidnap everybody and set a fire for covering the evidence."

"I believe I see the further implications," Adzel said softly. "Some attempt, perhaps, to domesticate the older captive humans. Presumably a failure, terminated by their murder, because the youngest ones don't remember natural parents. No doubt many infants died too, or were killed as being unpromising material. Quite possibly the half-dozen of Serendipity are the sole survivors. It makes me doubt that any nonhumans were similarly victimized. Leandra must have represented a unique opportunity."

"What it proves is bad enough," van Rijn said. "I can't push Beldaniel about her parents. She must feel suspicions, at least, but not dare let herself think about them. Because her whole soul is founded on being a creature of the Shenna. In fact, I got the impression of she being the special property of one among them—like a dog."

His hand closed around the tumbler with force that would have broken anything less strong than vitryl. "They want to make us the same, maybe?" he snarled. "No, by eternal damn! *Liever dood dan slaaf!*" He drained the last whiskey. "What means, I'll see them in Hell first . . . if I got to drag them down behind me!" The tumbler crashed warheadlike on the deck.

XX

The rendezvous site was listed in Technic catalogues. Scanning its standard memory units, the ship's computer informed van Rijn that this system had been visited once, about a century ago. A perfunctory survey revealed nothing of interest, and no one was recorded as having gone back. (Nothing except seven planets, seven worlds, with their moons and mysteries, life upon three of them, and one species that had begun to chip a few stones into handier shapes, look up at the night sky and gropingly wonder.) There were so uncountably many systems.

"I could have told you that," Thea said.

"Ha?" Van Rijn turned, planet-

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ponderous himself, as she entered the command bridge.

Her smile was shy, her attempt at friendliness awkward from lack of practice. "Obviously we couldn't give you a hint at anything you didn't already know. We picked a sun arbitrarily, out of deserted ones within what we guessed is a convenient volume of space for the Shenna."

"Hm-hm-m." Van Rijn tugged his goatee. "I wouldn't be an ungentleman, but wasn't you never scared I might grab you and pump you, I mean for where Dathyna sits?"

"No. The information has been withheld from me. Only the men, Latimer and Kim, were ever told, and they received deep conditioning against revealing it." Her gaze traveled around the stars which, in this craft built by nonhumans, showed as a strip engirdling the compartment. "I can tell you what you must have guessed, that some of the constellations are starting to look familiar to me." Her voice dropped. She reached her arms forth, an unconscious gesture of yearning. "They, the Shenna, will take me home. Moath himself may be waiting. *Eyar wathiya grazzan tolya . . .*"

Van Rijn said quietly, into her growing rapture: "Suppose they do not come? You said they might not. What do you do?"

She drew a quick breath, clenched her fists, stood for a moment as the loneliest figure he remembered seeing, before she turned to him. Her hands closed around his, cold and quick. "Then will you help me?" she begged. Fire mounted in her countenance. She withdrew. "But Moath will not abandon me!" She turned on her heel and walked out fast.

Van Rijn glowered at the star that waxed dead ahead, and took out his snuffbox for what consolation was in it.

But his hunch was right, that Thea had no real reason for worry. Sweeping inward, the ship detected emanations from a sizable flotilla, at an initial distance indicating those vessels had arrived two or three days ago. (Which meant they had departed from a point not much over a hundred light-years hence—unless Shenna craft could travel a great deal faster than Technic ones—and this was unlikely, because if the Shenna were not relative newcomers to space, they would surely have been encountered already by explorers—not to mention the fact that today's hyperdrive oscillator frequencies were crowding the maximum which quantum theory allowed—) They accelerated almost at the instant van Rijn came within detection range. Some fanned out, probably to make sure he didn't have followers. The rest converged on him. A code signal, which the Shenna must have learned from human slaves, flashed. Van Rijn obeyed, dropped

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into normal state, assumed orbit around the sun, and let the aliens position themselves however they chose.

Gathered again in the bridge before the main outercom, all three waited. Thea shivered, her face now red and now white, staring and staring at the ships which drew closer. Van Rijn turned his back on her. "I don't know why," he muttered to Adzel in one of the languages they were sure she did not have in common with them, "but I get some feeling I can't name from the sight of her like that."

"Embarrassment, probably," the Wodenite suggested.

"Oh, is that how it feels?"

"She is unlike me, of course, in her deepest instincts as well as her upbringing," Adzel said. "Regardless, I do not find it decent either to observe a being stripped so naked."

He concentrated his attention on the nearest Shenn craft. Its gaunt high-finned shape was partly silhouetted black upon the Milky Way, partly ashen by the distant orange sun. "A curious design," he said. "It does not look very functional."

Van Rijn switched to Anglic. "Could be hokay for machines, that layout," he remarked. "And why this many of them—fifteen, right?—big and hedgehoggy with weapons and would need hundreds in the crews—to meet one little unarmed speedster like us, unless they is mostly robots? I think they is real whizzards at robotics, those Shenna. Way beyond us. The SI computer system points likelywise."

Thea reacted in her joy as he had hoped. She could not keep from boasting, rhapsodizing, about the powerful and complex automatons whose multitudes were skeleton and muscle of the whole Dathynan civilization. Probably no more than three or four living Masters were in this group, she said. No more were needed.

"Not even for making dicker with us?" van Rijn asked.

"They speak for themselves alone," Thea said. "You don't have plenipotentiary powers either, you know. But they will confer with their colleagues after you have been interviewed." Her tone grew more and more absentminded while she spoke, until it faded into a kind of crooning in the guttural Shenn tongue. She had never ceased staring outward.

" 'They will confer with their colleagues,' " Adzel quoted slowly, in the private language. "Her phrase suggests that decision-making authority rests with an exceedingly small group. Yet it does not follow that the culture is an extreme oligarchy. Oligarchs would prefer live crews for most tasks, like us, and for the same reasons. No matter how effective a robot one builds, it remains a machine—essentially, an auxiliary to a live brain—because

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if it were developed so highly as to be equivalent to a biological organism, there would be no point in building it."

"*Ja,* I know that line of argument," van Rijn said. "Nature has already provided us means for making new biological organisms, a lot cheaper and more fun than producing robots. Still, how about the computer that has been speculated about, fully motivated but superior in every way to any being born from flesh?"

"A purely theoretical possibility in any civilization we have come upon thus far; and frankly, I am skeptical of the theory. But supposing it did exist, such a robot would rule, not serve. And the Shenna are obviously not subordinates. Therefore they have—well, on the whole, perhaps somewhat better robots than we do, perhaps not; certainly more per capita; nevertheless, only robots, with the usual inherent limitations. They employ them lavishly in order to compensate as best they can for those limitations. But why?"

"Little population? That would explain why they do not have many decision makers, if they do not."

"*Zanh-h-* . . . maybe. Although cannot offhand see how a society few in numbers could build—could even design—the vast, sophisticated production plant that Dathyna evidently possesses."

They had been talking largely to relieve their tension, quite well aware of how uncertain their logic was. When the ship said: "Incoming signal received," they both started. Thea choked a shriek. "Put them on, whoever they is," van Rijn ordered. He wiped sweat off his jowls with the soiled lace of one cuff.

The visiscreen flickered. An image sprang forth. It was half manlike; but swelling muscles, great bull head, iridescent mane, thunder that spoke from the opened mouth: were such embodied volcano power that Adzel stepped backward hissing.

"Moath!" Thea cried. She fell to her knees, hands outstretched toward the Shenn. Tears whipped down her face.

Life is an ill-arranged affair, where troubles and triumphs both come in lots too big to cope with, and in between lie arid stretches of routine and marking time. Van Rijn often spoke sharply to St. Dismas about this. He never got a satisfactory reply.

His present mission followed the pattern. After Thea said Moath her lord commanded her presence aboard the vessel where he was—largest of the flotilla, a dreadnaught in size, fantastically beweaponed—and entered a flitter dispatched for her, nothing happened for forty-seven hours and twenty-nine minutes by the clock. The Shenna sent no further word nor heeded any calls addressed to them. Van Rijn

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groaned, cursed, whined, stamped up and down the passages, ate six full meals a day, cheated at solitaire, overloaded the air purifiers with smoke and the trash disposal with empty bottles, and would not even be soothed by his Mozart symphonies. At last he exhausted Adzel's tolerance. The Wodenite locked himself in his own room with food and good books, and did not emerge until his companion yelled at the door that the damned female icicle with the melted brain was ready to interpret and maybe now something could be done to reward him, Nicholas van Rijn, for his Griselda-like patience.

Nonetheless, the merchant was showing her image a certain avuncular courtliness when Adzel galloped in. ". . . Wondered why you left us be when everybody traveled this far for meeting."

Seated before a transmitter pickup on the battleship, she was changed. Her garb was a loose white robe and burnoose and her eyes bore dark contact lenses, protection from the harsh light in that cabin. She was altogether self-possessed again, her emotional needs fulfilled. Her answer came crisp: "My lords the Shenna questioned me in detail, in preparation for our discussions. No one else from Serendipity was brought along, you see."

Below the viewfield of his own sender, van Rijn kept a scrib on his lap. Like fast hairy sausages, his fingers moved across the noiseless console. Adzel read an unrolling tape: *That was foolish. How could they be sure nothing would have happened to her, their link with us? More proof they rush into things, not stopping for thought.*

Thea was continuing. "Furthermore, before I could talk rationally, I must get the *haaderu*. I had been so long away from my lord Moath. You would not understand *haaderu*." She blushed the faintest bit, but her voice might have described some adjustment to a machine. "Consider it a ceremony in which he acknowledges my loyalty to him. It requires time. Meanwhile, the scoutships verified no one else had treacherously accompanied us at a distance."

Van Rijn wrote: *Not Jove. The Minotaur. Raw power and maleness.*

"I do not identify the reference," Adzel breathed in his ear.

What that Shenn beast really is to her. She is only somewhat a slave. I have known many women like her in offices, spinsters fanatically devoted to a male boss. No wonder the SI gang were four women, two men. Men seldom think quite that way. Unless first they are conditioned, broken. I doubt if those people have had any sex relationship. The Latimer marriage was to prevent gossip. Their sexuality has been directed into the channel of serving the Shenna. Of course, they don't realize that.

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"My lords will now hear you," Thea Beldaniel said. For an instant, humanness broke through. She leaned forward and said, low and urgent: "Nicholas, be careful. I know your ways, and I'll translate what you mean, not what you say. But be careful what you mean, too. I won't lie to them. And they are more easily angered than you might think. I—" She paused a second. "I want you to go home unhurt. You are the, the only man who was ever kind to me."

Bah, he wrote, *I played Minotaur myself, once I saw she wished for something like that, though I supposed at the time that it was Jove. She responded, not conscious of what moved her. Not but what she doesn't deserve to be led back into her own species. That is a filthy thing they have done to her.*

Thea gestured. A robot responded. The view panned back, revealing a great conference chamber where four Shenna sat on cushions. Van Rijn winced and mumbled an oath when he saw the decor. "No taste, not by no standards nowhere in the universe or Hell! They skipped right past civilization them, gone straight from barbarism to decadence." It was Adzel who, as the conference progressed and the focus of view shifted about, remarked on a few ancient-looking objects in that overcrowded room which were lovely.

A voice rolled from one shaggy deep chest. Dwarfed and lost-looking, but her glance forever straying back to adore the Shenn called Moath, Thea interpreted: "You have come to speak of terms between your people and mine. What is the dispute?"

"Why, nothings, really," van Rijn said, "except could be a few pieces of dirt we divvy up like friends instead of blowing our profit on squabbles. And maybe we got things we could trade, or teach each other, like how about one of us has a fine new vice?"

Thea's translation was interrupted halfway through. A Shenn asked something at some length which she rendered as: "What is your alleged complaint against us?"

She must have shaded her interpretation from that side also, but van Rijn and Adzel were both too taken aback to care. "Complaint?" the Wodenite nearly bleated. "Why, one scarcely knows where to begin."

"I do, by damn," van Rijn said, and commenced.

The argument erupted. Thea was soon white and shaking with nerves. Sweat plastered her hair to her brow. It would be useless to detail the wranglings. They were as confused and pointless as the worst in human history. But piece by piece, through sheer stubbornness and refusal to be outshouted, van Rijn assembled a pattern.

Item: Serendipity had been organized to spy upon the Poleso-

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technic League and the whole Technic civilization.

Answer: The Shenna had provided the League with a service it was too stupid to invent for itself. *The forced sale of Serendipity* was a bandit act for which the Shenna demanded compensation.

Item: David Falkayn had been kidnapped and drugged by Shenna agents.

Answer: One inferior organism was not worth discussing.

Item: Humans had been enslaved, and probably other humans had been massacred, by Shenna.

Answer: The humans were given a nobler life in service to a higher cause than could ever have been theirs otherwise. Ask them if this was not true.

Item: The Shenna had tried to keep knowledge of a new planet from those who were entitled to it.

Answer: The ones entitled were the Shenna. Let trespassers beware.

Item: Despite their espionage, the Shenna did not seem to appreciate the strength of the Technic worlds and especially the League, which was not in the habit of tolerating menaces.

Answer: Neither were the Shenna.

About that time, Thea collapsed. The being called Moath left his place and went to stoop over her. He looked, briefly, into the screen. His nostrils were dilated and his mane stood erect. He snorted a command. Transmission ended.

It was undoubtedly just as well.

Van Rijn woke so fast that he heard his own final snore. He sat up in bed. His stateroom was dark, *murmurous with ventilation*, a slight sugary odor in the air because no one had adjusted the chemosystem. The mechanical voice repeated: "Incoming signal received."

"Pestilence and pustules! I heard you, I heard you, let me haul my poor tired old body aloft, by damn." The uncarpeted deck was cold under his feet. From a glowing clock face he saw he had been asleep for not quite six hours. Which made over twenty hours since the conference broke off. If you could dignify that slanging match by that name. What ailed those shooterbulls, anyhow? A high technological culture such as was needed to build robots and spaceships ought to imply certain qualities—a minimum level of diplomacy and caution and enlightened self-interest—because otherwise you would have wrecked yourself before you progressed that far . . . Well, maybe communications had stayed off until now because the Shenna were collecting their tempers . . . Van Rijn hurried down the corridor. His nightgown flapped around his ankles.

The bridge was another humming emptiness. Taking its orders literally, the computer had stopped annunciating when it got a re-

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sponse. Adzel, his ears accustomed to denser air, was not roused in that short time. The machine continued as programmed by reporting: "Two hours ago, another spacecraft was detected in approach from the Circinus region. It is still assuming orbit but is evidently in contact with those already present—"

"Shut up and put me on," van Rijn said. His gaze probed the stars. An eellike destroyer, a more distant cruiser, a point of light that could be the Shenn flagship, drifted across his view. No visible sign of the newcomer. But he did not doubt that was what had caused this summons.

The viewscreen came on. Thea Beldaniel stood alone in the harsh-lit, machine-murmurous cavern of the conference chamber. He had never seen her so frantic. Her eyes were white-rimmed, her mouth was stretched out of shape.

"Go!" Nor was her voice recognizable. "Escape! They're talking with Gahood. They haven't thought of ordering the robots to watch you. You can leave quietly . . . maybe . . . get a head start, or lose them in space—but they'll kill you if you stay!"

He stood altogether unmoving. His deepened tone rolled around her. "Please to explain me more."

"Gahood. He came . . . alone . . . Hugh Latimer's dead or—I sleep in my lord Moath's cabin by the door. An intercom call. Thellam asked him to come to the bridge, him and everyone. He said Gahood was back from Dathyna, Gahood who went to the giant star where the rogue is, and something happened so Gahood lost Latimer. They should meet, hear his full story, decide—" Her fingers made claws in the air. "I don't know any more, Nicholas. Moath gave me no command. I w-w-would not betray him . . . them . . . never . . . but what harm if you stay alive? I could hear the fury gather, *feel* it; I know them; whatever this is, they'll be enraged. They'll have the guns fire on you. Get away!"

Still van Rijn had not stirred. He was quiet until some measure of control returned to her. She shuddered, her breath was uneven, but she regarded him half sanely. Then he asked: "Would they for sure kill Adzel and me? Hokay, they are mad and don't feel like more jaw-jaw right now. But would not sense be for them, they take us home? We got information. We got hostage value."

"You don't understand. You'd never be freed. You might be tortured for your knowledge, you'd surely be drugged. And I would have to help them. And in the end, when you're no further use—"

"They knock me on the head. *Ja, ja,* is clear. But I got a hard old noggle." Van Rijn leaned forward, resting his fingertips lightly on a chairback and his weight on them, catching her look and not letting

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go. "Thea, if we run, maybe we get away, maybe we don't. I think chances is not awesome good. Those destroyers, at least, I bet can outrun me, what is fat in the shanks. But if we go to Dathyna, well, maybe we can talk after your bosses cool down again. Maybe we strike a bargain yet. What they got to lose, anyhows, taking us along? Can you get them not to kill us, only capture us?"

"I . . . well, I—"

"Was good of you to warn me, Thea. I know what it cost you, I think. But you shouldn't get in trouble, neither, like you might if they find we skedoodled and guessed it was your fault. Why don't you go argue at your Moath? You remind him here we is and he better train guns on us and you better tell us we is prisoners and got to come to Dathyna. Think he does?"

She could not speak further. She managed a spastic nod.

"Hokay, run along." He blew her a kiss. The effect would have been more graceful if less noisy. The screen blanked. He stumped off to find a bottle and Adzel, in that order. But first he spent a few minutes with St. Dismas. If rage overrode prudence among the Shenna, despite the woman's pleas and arguments, he would not be long alive.

XXI

At full pseudospeed, from the nameless star to the sun of Dathyna took a bit under a week. The prisoner ship must strain to keep pace with the warcraft that surrounded her. But she succeeded, which told Earthman and Wodenite something about Shenn space capabilities.

They gathered quite a few other facts en route. This did not include the contents of Gahood's message, nor the reason why it sent the team plunging immediately homeward. But their captors questioned them at irregular intervals, by hypercom. The interrogation was unsystematic and repetitive, seemingly carried out whenever some individual Shenn got the impulse, soon degenerating into boasts and threats. Van Rijn gave many truthful answers, because the aliens could generally have obtained them directly from Thea—population, productivity, et cetera of the major Technic worlds; nature and activities of the Polesotechnic League; picturesque details about this or that life form, this or that culture—She was plainly distressed at the behavior of her lords, and tried to recast their words into something better organized. By playing along with her, van Rijn was able to draw her out. For example:

"Lord Nimran wants to hear more about the early history of Earth," she told the merchant. Computers on either vessel converted between dot-dash transmission and voice. "He is especially

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interested in cases where one civilization inherited from another."

"Like Greeks taking over from Minoans, or Western Christendom from Roman Empire, or Turks from Byzantines?" van Rijn asked. "Cases are not comparable. And was long ago. Why should he care?"

He could imagine how she flushed. "It suffices that he does care."

"Oh, I don't mind making lectures at him. Got nothings else to do except pour me another beer. Speaking about which—" Van Rijn leaned over and fumbled in the cooler that Adzel had carried to the bridge for him. "Ah, there you are, fishie."

The computer turned this into hyperimpulses. The receiving computer was not equipped to translate, but its memory bank now included an Anglic vocabulary. Thea must have told Nimran that he had not properly replied. Did the minotaur growl and drop hand to gun? Her plea was strained through the toneless artificial voice: "Do not provoke him. They are terrible when they grow angry."

Van Rijn opened the bottle and poured into a tankard. "*Ja,* sure, sure. I only try for being helpful. But tell him I got to know where he wants his knowledge deepened before I can drill in the shaft. And why. I feel the impression that Shenn culture does not produce scientists what wants to know things from pure curiosity."

"Humans overrate curiosity. A monkey trait."

"Uh-huh, uh-huh. Every species got its own instincts, sometimes similar at some other race's but not necessary so. I try now to get the basic instinct pattern for your . . . owners . . . because elsewise what I tell them might not be what they want, might not make any sense to them whatsomever. Hokay, you tell me there is no real science on Dathyna. No interest in what isn't practical, or edible, or drinkable (*Aaahhh!*), or salable, or useful in other ways I should not mention to a lady."

"You oversimplify."

"I know. Can't describe one single individual being in a few words, let alone a whole intelligent race. Sure. But speaking rough, have I right? Would you say this society is not one for abstracted science and odd little facts what aren't relevancy right away?"

"Very well, agreed." There came a pause, during which Thea was probably calming Nimran down again.

Van Rijn wiped foam off his nose and said: "I collect from this, is only one Shenn civilization?"

"Yes, yes. I must finish talking to him." After a couple of minutes: "If you do not start answering, the consequences may be grave."

"But I told you, sweetling, I'm not clear what is his question. He has not got a scientific curiosity, so he asks about successions of culture

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on Earth because might be is something useful to his own recent case on Dathyna. True?"

After hesitation: "Yes."

"All right, let us find out what kind of succession he is interested in. Does he mean how does a supplanter like Hindu appear, or a hybrid like Technic or Arabic, or a segue of one culture into another like Classical into Byzantine, or what?"

No doubt forlornness crossed her eyes. "I don't know anything myself about Earth's history."

"Ask him. Or better I should ask him through you."

In this manner, van Rijn got confirmation of what he suspected. The Shenna had not created the magnificent cybernetic structure they used. They took it over from an earlier race, along with much else. Still more appeared to have been lost, for the Shenna were conquerors, exterminators, savages squatting a house erected by civilized beings whom they had murdered. (How was this possible?)

They were not less dangerous on that account, or because they were herbivorous. (What kind of evolution could produce warlike herbivores?)

They had the wit to heed the recommendation of the Serendipity computer as regards the planet at Beta Crucis. They could see its industrial potential. But they were more concerned with denying this to others than with making intensive use of it themselves. For they were not traders or manufacturers on any significant scale. Their robots produced for them the basic goods and services they required, including construction and maintenance of the machinery itself. They had no desire for commercial or intellectual relations with Technic societies. Rather, they believed that coexistence was impossible. (Why?)

The Serendipity operation typefied them. When they first happened upon other races that traveled and colonized through space, out on the fringe of the existing Technic sphere, they proceeded to study these. Their methods were unspecified, and doubtless varied from place to place and time to time, but need not always have been violent. A Shenn could be cunning. Since no one can remember all the planets whose natives may go a-roving, he need not admit he came from Outside, and he could ask many natural-sounding questions.

Nevertheless, they could not secretly get the detailed information they wanted by such hit-and-run means. One brilliant male among them conceived the idea of establishing spies in the heart of the other territory: spies who could expect the eager cooperation of their victims. His fellows agreed to help start the enterprise. No Shenn had the patience to run that shop

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in Lunograd. But computers did.

Even so, the basic program for the machines and doctrine for the people were drawn up by Shenna. And here the nature of the beast again revealed itself. *When something important and urgent comes up, react aggressively—fast!* Most species would have given an agency more caution, more flexibility. The Shenna could not endure to. Their instinct was such that to them, in any crisis, action was always preferable to wait-and-see. The pieces could be picked up later.

The Shenna did have a rationale for their distrust of other space-going races. (Which distrust automatically produced murderous hatred in them.) They themselves were not many. Their outplanet colonies were few, small, and none too successful. Four-fifths of their adults must be counted out as significant help—because the females outnumbered the polygynous males by that fraction, and were dull-brained subservient creatures. Their political structure was so crude as to be ridiculous. Baronial patriarchs, operating huge estates like independent kingdoms, might confer or cooperate at need, on a strictly voluntary basis; and this constituted the state. Their economics was equally primitive. (How had a race like this gone beyond the Paleolithic, let alone destroyed another people who had covered the planet with machines and were reaching for the stars?)

The companies of the League could buy and sell them for peanuts. The outward wave of Technic settlement would not necessarily sweep over them when it got that far—why bother?—but would certainly engulf every other desirable world around Dathyna. At best, with enormous effort, the Shenna might convert themselves into one more breed of spacefarers among hundreds. To natures like theirs, that prospect was intolerable.

However their society was describable, they were not ridiculous themselves. On the contrary, they were as ominous as the plague bacillus when first it struck Europe. Or perhaps more so; Europe did survive.

XXII

The sun of Dathyna looked familiar to Adzel—middle F-type, 5.4 times as luminous as Sol, white more than gold—until he studied it with what instruments he had available. Astonished, he repeated his work, and got the same results. "That is not a normal star," he said.

"About to go nova?" van Rijn asked hopefully.

"No, not that deviant." Adzel magnified the view, stepping down the brilliance, until the screen showed a disk. The corona gleamed immense, a beautiful serene nacre; but it was background for the seething of flares and prominences, the dense mottling of spots. "Observe

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the level of output. Observe likewise the intricate patterns. They show a powerful but inconstant magnetic field . . . Ah." A pinpoint of eye-hurting light flashed and died on the surface. "A nuclear explosion, taking place within the photosphere. Imagine what convection currents and plasma effects were required. Spectroscopy is consistent with visual data, as is radiation metering. Even at our present distance, the solar wind is powerful; and its pattern as we move inward is highly changeable." He regarded the scene with his rubbery lips pulled into an alarming smile. "I had heard of cases like this, but they are rare and I never thought I would have the good fortune to see one."

"I'm glad you get fun out of now," van Rijn grumbled. "Next funeral I attend, I want you along for doing a buck-and-wing while you sing 'Hey nonny nonny.' So what we got here?"

"A sun not only massive, but of unusual composition, extremely rich in metals. Probably it condensed in the neighborhood of a recent supernova. Besides the normal main-sequence evolution, a number of other fusion chains, some of which terminate in fission, go on during its life. This naturally influences interior phenomena, which in turn determine the output. Consider it an irregularly variable star. It isn't really, but the pattern is so complex that it does not repeat within epochs. If I interpret my findings correctly, it is at present receding from a high peak which occurred—*zanh-h-h,* several thousand years ago, I would guess."

"But did not wipe out life on Dathyna?"

"Obviously not. The luminosity will never become that great, until the sun leaves the main sequence altogether. Nevertheless, there must have been considerable biological effect, especially since the charged-particle emission did reach an extreme."

Van Rijn grunted, settled deeper in his chair, and reached for his churchwarden. He usually smoked it when he wanted to think hard.

The flotilla approached Dathyna. The computer of the captive ship kept all sensors open as instructed, and reported much activity in surrounding space—ships in orbit, ships coming and going, ships under construction. Adzel took readings on the globe itself.

It was the fourth one out from its sun, completing a period of 2.14 standard years at a mean distance of two a.u. in mass it likewise resembled Mars: 0.433 Terrestrial, the diameter only 7,950 kilometers at the equator. Despite this, and a third again the heat and light which Earth receives, Dathyna had an extensive oxynitrogen atmosphere. Pressure dropped off rapidly with altitude, but at sea level was slightly greater than Terrestrial. Such an

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amount of gas was surely due to the planetary composition, an abundance of heavy elements conferring an overall specific gravity of 9.4 and thus a surface acceleration of 1,057 cm/sec^2. The metal-rich core must have produced enormous outgassing through vulcanism in the world's youth. Today, in combination with the fairly rapid spin—once around in seventeen and a quarter hours—it generated a strong magnetic field which screened off most of the solar particles that might otherwise have kicked air molecules free. The fact was also helpful that Dathyna had no moons.

Visually, swelling upon blackness and stars, the planet was equally strange. It had far less hydrosphere then Earth; quanta from the ultraviolet-spendthrift sun had split many a water molecule. But because mountains and continental masses were less well defined, the surface flatter on the average, water covered about half. Shallow, virtually tideless, those seas were blanketed with algalike organisms, a red-brown-yellow mat that was sometimes ripped apart to show waves, sometimes clotted into floating islands.

With slight axial tilt and comparatively small edge effect, the polar regions did not differ spectacularly from the equatorial. But with a steep air pressure gradient, the uplands were altogether unlike the valleys beneath—were glacier and naked rock. Some lowlands, especially along the oceans, appeared to be fertile. The brownish-gold native vegetation colored them; forests, meadows, croplands showed in the magniscreen. But enormous regions lay desert, where dust storms scoured red rock. And their barrenness was geologically new—probably not historically too old—because one could identify the towers and half buried walls of many great dead cities, the grid of highways and power pylons that a large population once required.

"Did the sun burn the lands up when it peaked?" For once, van Rijn almost whispered a question.

"No," Adzel said. "Nothing that simple, I think."

"Why not?"

"Well, increased temperature would cause more evaporation, more clouds, higher albedo, and thus tend to control itself. Furthermore, while it might damage some zones, it would benefit others. Life should migrate poleward and upward. But you can see that the high latitudes and high altitudes have suffered as badly as any place. Then too, a prosperous, energetic machine culture ought to have found ways of dealing with a mere change in climate—a change which did not come about overnight, remember."

"Maybe they held a war what got rough?"

"I see no signs of large-scale misuse of nuclear energies. And would any plausible biological or chemical agents wreck the entire ecology

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of an entire planet, right down to the humble equivalents of grass? I think," said Adzel grimly, "that the catastrophe had a much larger cause and much deeper effects."

He got no chance to elaborate then, for the ship was ordered into atmosphere. A pair of destroyers accompanied. Moath and Thea directed the robots from a tender. The group landed near the Shenn's ancestral castle. An armed swarm ran forth to meet them.

In the next three days, van Rijn and Adzel were given a look around. Thea guided them. "My lord permits this on my recommendation, while he is away at the Grand Council that's been called," she said. "By giving you a better comprehension of our society, we make you better able to help us with information." Pleadingly, not meeting their eyes: "You will help, won't you? You can't do anything else, except die. My lord will treat you well if you serve him well."

"So let's see what it's like where we got to pass our lives," van Rijn said.

The party was heavily guarded, by young males—the sons, nephews, and retainers who comprised Moath's fighting cadre—and robot blastguns that floated along on gravity platforms. Adzel's size inspired caution, though he acted meek enough. Youngsters and idle servants trailed after. Females and workers goggled as the outworlders passed by. The Shenna race was not absolutely devoid of curiosity; no vertebrate is, on any known planet. They simply lacked the intensity of it that characterizes species like Homo or Dracocentaurus Sapiens. They were quite analogous in their love of novelty.

"Castle" was a misleading word for the establishment. Once there had been an interlinked set of buildings, an enormous block, five or six kilometers on a side, a full tenth as high—yet for all that mass, graceful, many-colored, with columns of crystal that were nonfunctional but a joy to the eye, with towers that soared so far above the walls that their petal-shaped spires nearly vanished in heaven. It had been a place where millions lived and worked, a community which was an engineered unit, automated, nuclear-powered, integrated through traffic and communication with the whole planet.

Now half of it was a ruin. Pillars were fallen, roofs gaped to the sky, machines had corroded away, creatures like birds nested in the turrets and creatures like rats scuttered through the apartments. Though destruction had passed the rest by, and the patient self-maintaining robots kept it in repair, the echoing hollowness of too many corridors, the plundered bareness of too many rooms and plazas and terraces, were more oppressive than the broken sections.

Thea refused to say what had

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happened, centuries past. "Are you forbidden to tell us?" Adzel asked.

She bit her lip. "No," she said in a sad little voice, "not exactly. But I don't want to." After a moment: "You wouldn't understand. You'd get the wrong idea. Later, when you know our lords the Shenna—"

About half of the functional half of the complex was occupied today. The dwellers were not haunted by the past. They seemed to regard its overwhelming shell as part of their landscape. The ruins were quarried —that was one reason they were in poor condition—and the remainder would be taken over as population grew. A busy, lusty, brawling life surged between the walls and across the countryside. While robots did most of the essential work, Moath's folk had plenty of tasks left to do, from technical supervision to their crude arts and crafts; from agriculture and forestry to prospecting and hunting; from education for one's state in a hierarchical society to training for war. Aircraft bore passengers and cargo from other domains. Gravships shuttled between the planets of this system; hyperships trafficked with colonies newly planted among the nearer stars, or prowled further in exploration and imperialism. Even the peaceful routines of Dathyna had that thunderous vigor which is the Minotaur's.

Nonetheless, here was a life-impoverished world—metal-rich but life-impoverished. The crops grew thin in dusty fields. A perpetual faint stench hung in the air, blown from the nearby ocean, where the vast sea-plant blanket was dying and rotting faster than it replenished itself. The eastern hills were wooded, but with scrubby trees growing among the traces of fallen giants. At night, a hunter's trumpet sounded from them lonelier than would have been the howl of the last wolf alive.

Adzel was astounded to learn that the Shenna hunted and, in fact, kept meat animals. "But you said they are herbivorous," he protested.

"Yes, they are," Thea replied. "This sunlight causes plants to form high-energy compounds which will support a more active, hence intelligent animal than on the world of a Sol-type star."

"I know," Adzel said. "I am native to an F_5 system myself—though on Zatlakh, Woden, animals generally spend the extra energy on growing large, and we sophonts are omnivorous. I suppose the Shenna must process meat before they can digest it?"

"Correct. Of course, I am sure you know better than I how vague the line is between 'carnivore' and 'herbivore.' I have read, for instance, that on Earth, ungulates habitually eat their own placentas after bringing forth young, whereas cats and dogs often eat grass. Here on Dathyna, a further possibility exists. Certain fruit juices make meat nourishing for any normally vegetarian creature, through enzyme ac-

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tion. The treatment process is simple. It was discovered in . . . in early times, by the primitive ancestors of today's Shenna. Or perhaps even earlier."

"And on a planet which had suffered ecological disaster like this one, every food source must be utilized. I see." Adzel was satisfied.

Until van Rijn said: "But the Shenna goes hunting, tallyho, for fun. I'm sure they does. I watched that young buck ride home yesterday wearing the horns off his kill. He'd used a bow, too, when he got a perfect good gun. That was sport."

Thea arched her brows. "And why not?" she challenged. "I'm told most intelligent species enjoy hunting. Including our own."

"*Ja, ja.* I don't say is bad, unless they start chasing me. But where do we get the instinct that makes us feel good when we catch and kill? Maybe just catch a photograph . . . though very few people what would never kill a deer do not get happy to swat a fly. How come?" Van Rijn wagged a finger. "I tell you. You and me is descended from hunters. Pre-man in Africa was a killer ape. Those what was not natural-born killers, they did not live to pass on their squeamery. But ancestors of Shenna was browsers and grazers! Maybe they had fights at mating season, but they did not hunt down other animals. Yet Shenna now, they do. How come *that?*"

Thea changed the subject. It was easy to do, with so much to talk about, the infinite facets of a planet and a civilization. One must admit the Shenna were civilized in the technical sense of the word. They had machines, literacy, a world-wide culture which was becoming more than world-wide. To be sure, they were inheritors of what the earlier society had created. But they had made a comeback from its destruction, restored part of what it had been, added a few innovations.

And their patriarchs aimed to go further. Elsewhere on Dathyna, they met in stormy debate to decide —what? Van Rijn shivered in a gathering dusk. The nights of this semidesert were cold. It would be good to enter the warmth and soft light of his ship.

He had won that concession after the first night, which he and Adzel spent locked in a room of the castle. The next morning he had been at the top of his form, cursing, coughing, wheezing, weeping, swearing by every human and nonhuman saint in or out of the catalogue that one more bedtime without respite from the temperatures, the radiation, the dust, the pollen, the heavy metals whose omnipresence not only forced outworlders to take chelating pills lest they be poisoned but made the very air taste bad, the noises, the stinks, the everything of this planet whose existence was a potent argument for the Manichaean heresy because he could not imagine why a benevolent God

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would wish it on the universe: another night must surely stretch his poor old corpse out stiff and pitiful — Finally Thea grew alarmed and took it upon herself to change their quarters. A couple of engineer officers with robot assistance disconnected the drive units of the League vessel. It was a thorough job. Without parts and tools, the captives had no possibility of lifting that hull again. They might as well sleep aboard. A guard or two with a blast-cannon could watch outside.

Late on the third day, Moath returned.

Van Rijn and Adzel observed the uproar from a distance, as his folk boiled around the overlord. He addressed them from an upper airlock chamber in his personal spaceflitter. His voice rolled like surf and earthquake. Hurricane answered from the ground. The young Shenna roared, capered, danced in rings, hammered on the boat's side till it rang, lifted archaic swords and fired today's energy weapons into the air. From the highest remaining tower, a banner was raised, the color of new blood.

"What's he say?" van Rijn asked. Thea stood moveless, eyes unfocused, stunned as if by a blow to the head. He seized her arm and shook her. "Tell me what he said!" A guard tried to intervene. Adzel put his bulk between long enough for van Rijn to trumpet loud as Moath himself: "Tell me what is happening! I order you!"

Automatically in her shock, she obeyed the Minotaur.

Soon afterward, the prisoners were herded into their ship. The lock valves hissed shut behind them. Viewscreens showed frosty stars above a land turned gray and shadowful, the castle ablaze with light and immense bonfires leaping outside. Sound pickups brought the distant wail of wind, the nearby bawling, bugling, clangor and drum-thud of the Shenna.

Van Rijn said to Adzel: "You do what you like for an hour. I will be with St. Dismas. Got to confess to somebody." He could not refrain from adding: "Ho, ho, I bet he never heard a hotter confession than he's going to!"

"I shall relive certain memories and meditate upon certain principles," Adzel said, "and in one hour I will join you in the command bridge."

That was where van Rijn had explained why he surrendered to the enemy, back in the system of the nameless sun.

"But we could perhaps give them the slip," Adzel had protested. "Granted, the chance of our success is not good. At worst, though, they will overtake and destroy us. A quick, clean death, in freedom, almost an enviable death. Do you really prefer to become a slave on Dathyna?"

"Look," van Rijn answered with rare seriousness, "is necessary, ab-

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solute necessary our people learn what these characters is up to, and as much as possible about what they is like. I got a hunch what smells like condemned Limburger, they may decide on war. Maybe they win, maybe they lose. But even one surprise attack on a heavy-populated planet, with nuclear weapons —millions dead? Billions? And burned, blind, crippled, mutated . . . I am a sinful man, but not that sinful I wouldn't do what I could for trying to stop the thing."

"Of course, of course," Adzel said; and he was unwontedly impatient. "But if we escape, we can convey an added warning, to emphasize what will be read when your papers are released on Earth. If we go to Dathyna, though—oh, granted, we probably will gather extremely valuable information. But what good will it do our people? We will surely not have access to spacecraft. The great problem of military intelligence has always been less its collection than its transmission home. A classic example."

"Ah," said van Rijn. "You would ordinary be right. But you see, we will probable not be alone there."

"Yarru!" Adzel said. That relieved him sufficiently that he sat down, curled his tail around his haunches, and waited.

"See you," van Rijn said around a glass of gin and a cigar, "this Gahood fellow was Hugh Latimer's owner. We know that from Thea. We know, too, Latimer's lost to him. And we know he brought news what has got eggbeaters going in everybody's nuts here. That is all we know for sure. But we can deduce a snorky lot from it, I tell you.

"Like from the timing. Dathyna got to be about one week from this star. We can assume a straight line Sol-here-there, and not be too far off. Beta Crucis is like two weeks from Sol. Do a little trigonometrizing, angle between Southern Cross and Compass—is very rough approximations, natural, but timing works out so close it makes sense, like follows:

"Latimer would report straight to his boss, Gahood, on Dathyna. Gahood would go straight to Beta Crucis for a look—we seen how these Shenna is bulls in a china shop, and life is the china shop—and Latimer would go along. Takes them maybe two and a half weeks. So they arrive when Davy Falkayn and Chee Lan is still there. Our friends could not get decent data on the rogue in less time, two of them in one ship. Right away, though, Gahood returns to Dathyna. When he comes there, he learns about this meeting with you and me. He runs here and tells his chumsers about something. The timing is right for that kind of Gahood-trek, and it fits the pattern for everything else."

"Yes-s-s," Adzel breathed. His tailtip stirred. "Gahood arrives in great agitation, and without Latimer, who is gone."

"Gone—where else but at Beta

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Crucis?" van Rijn said. "If he was lost any place else, nobody would care except maybe Gahood. Looks like Gahood tangled with our friends yonder. And he was the one got knotted. Because if he had won over them, he would hardly come out here to brag about it . . . and for sure the other Shenna would not react with anger and alarm.

"Also: it would not matter if Latimer got killed in a fight. Only another slave, *nie?* But if he got captured, now—ho-ho! That changes a whole picture. From him can be squeezed many kinds fine information, starting with where is Dathyna. No wondering that Gahood galloped straight out here! These Shenna got to be warned about a changed situation before they maybe make a deal with us. Not so?" Van Rijn swigged deep.

"It appears plausible, then, that *Muddlin' Through* is bound home with her gains," Adzel nodded. "Do you think, therefore, we may be liberated by friendly forces?"

"I would not count on it," van Rijn said, "especial not when we is held by people like these, what would likely take out their irritations at being defeated on us. Besides, we don't know for sure a war is fermenting. And we want to prevent one if we can. I don't think, though, neither, that *Muddlin' Through* is homeheaded. I just hope the Shenna assume so, like you."

"What else?" Adzel asked, puzzled again.

"You is not human, and you don't always follow human mental processing. Likewise Shenna. Has you forgot, Falkayn can send a message capsule back with his data? Meanwhile, he sees Gahood going off. He knows Gahood will alert Dathyna. Will soon be very hard to scout that planet. But if he goes there direct, fast, to a world what has relied on its whereabouts not being known to us and therefore probably has not got a lot in the way of pickets—he should could sneak in."

"And be there yet?"

"I am guessing it. Takes time to study a world. He'll have a way planned for outsneaking too, of course." Van Rijn lifted his head, straightened his back, squared his shoulders, and protruded his belly. "Maybe he can get us away. Maybe he can't. But *Deo volente,* he might be able to carry home extra information, or urgent information, we slip to him. There is lots of ugly little ifs in my logic, I know. The odds is not good. But I don't think we got any choice except taking the bet."

"No," said Adzel slowly, "we do not."

The celebration was fading at the castle when Wodenite met human in the bridge. As the fires burned low, the stars shone forth more coldly bright.

"We are fortunate that they did not dismantle our communicators," Adzel said. There was no reason to

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speak otherwise than impersonally. What they were about to do might bring immediate death upon them. But they considered themselves doomed already, they had made their separate peaces, and neither was given to sentimentalism. When van Rijn sat down, though, the dragon laid one great scaly hand on his shoulder; and the man patted it briefly.

"No reason they should," van Rijn said. "They don't think Davy and Chee might be doing a skulk-about somewhere near. Besides, I told Beldaniel it would help me understand the Shenna if I could tune in their programs." He spat. "Their programs is terrible."

"What waveband will you use?"

"Technic Standard Number Three, I guess. I been monitoring, and don't seem like the Shenna use it often. *Muddlin' Through* will have one receiver tuned in on it automatic."

"If *Muddlin' Through* is, indeed, free, functional, and in range. And if our transmission does not happen to be intercepted."

"Got to assume somethings, boy. Anyhow, a Shenna radio operator what chances to hear us making our code might well assume it is ordinary QRN. It was made up with that in mind. Open me a beer, will you, and fill my pipe yonder? I should start sending."

His hand moved deftly across the keyboard.

Nicholas van Rijn, Master Merchant of the Polesotechnic League, calling . . .

The following has been learned about Dathyna and the majority of its inhabitants . . .

Now stand by for my primary message.

Realizing that the location of their planet is, with fair probability, no longer a secret, the Shenna have not reacted as most sophonts would, by strengthening defenses while searching for ways and means of accommodation with us. Instead, their Grand Council has decided to hazard all on an offensive launched before the sprawling, ill-organized Technic sphere can gather itself.

From what little we have learned of it, the idea is militarily not unsound. Though inefficient, Shenn warships are numerous, and each has more firepower than any of ours in the corresponding class. From the Serendipity operation, their naval intelligence has an enormous amount of precise information about those races and societies we lump together as "Technic." Among other things, the Shenna know the Commonwealth is the heart of that complex, and that the Commonwealth has long been at peace and does not dream any outsiders would dare attack. Hostile fleets could pass through its territory unbeknownst; when they did come in detection range, it would be too late for a world that was not heavily defended.

The Shenn scheme is for a series

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of massive raids upon the key planets of the Commonwealth, and certain others. This will create general chaos, out of which Dathyna may hope to emerge dominant if not absolutely supreme. Whether the Shenna succeed or not, obviously whole civilizations will be wiped out, perhaps whole intelligent species, surely untold billions of sophonts.

It will doubtless take the enemy some time to marshal his full strength, plan the operation and organize its logistics. The time will be increased above a minimum by the arrogance of the Shenn lords and the half anarchic character of their society. On the other hand, their built-in aggressiveness will make them cut corners and accept deficiencies for the sake of getting on with the assault.

The League should be able to take appropriate countermeasures, without calling upon governmental assistance, if it is warned soon enough. That warning must be delivered at once. To David Falkayn, Chee Lan, and/or any other entities who may be present: Do not spend a minute on anything else. Go home immediately and inform the leadership of the League.

XXIII

Night was younger where the Cynthian lurked. But the desert was fast radiating the day's heat outward to the stars. Their swarms, and the shimmer of a great aurora, were sufficiently bright for crags and dunes to stand ghost-gray and cast shadows. She fluffed her fur in the chill. For minutes after landing she waited behind the thorny bush she had chosen from aloft. No scent came to her but its own acridity, no sound but a wind-whimper, no sight but a veil of blowing dust.

Her caution was only partly because animals laired in abandoned places. The guns she wore—blaster, slugthrower, needler, and stunner—could handle any beast of prey; against the possibility of venomous creatures she put her senses and reflexes. But most of the ruins she had seen thus far were inhabited by Dathynans, and correspondingly dangerous. While those little groups appeared to be semi-barbaric hunters and herders—she and Falkayn were still too ignorant about conditions to try spying on the larger and more advanced communities—they owned firearms. Worse, Muddlehead reported detecting electronic transceivers in their huddling places, doubtless supplied by traders from the "baronies."

It had not been difficult for the ship to descend secretly, or to flit around after dark and hole up in the wastelands by day. The lords of this world had not expected its location to become known and had thus not done much about posting sentinels in orbit. Nor had they installed anything like an atmospheric traffic monitor. Let some sheik relate an

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encounter with an alien, though, and matters would change in a hurry.

Falkayn dared not visit any settlement. He was too big and awkward. Chee Lan could fly close with a gravity impeller, then work her little self into a position from which she observed what went on.

The present location, however, was empty. She had rather expected that. The interwoven buildings stood in the middle of a region which erosion had scoured until it could probably support none except a few nomads. She saw signs of them, cairns, charcoal, scattered trash. But nothing was recent. The tribe—no, patriarchal clan was probably more accurate—must be elsewhere on its annual round. Good; Falkayn could bring the ship here and work. This site looked richer than the one he was currently studying. More and more, it seemed that the key to Dathyna's present and future lay in its near past, in the downfall of a mighty civilization.

Of an entire species. Chee was becoming convinced of that.

She left her concealment and approached the ruins. Shards of masonry, broken columns, rust-eaten machines thrust from the sand like tombstones. Walls loomed high above her; but they were worn, battered, smashed open in places, their windows blind and their doors agape. Few, if any, Dathynan communities had simply been left when their hinterlands failed them. No, they were burst into, plundered and vandalized. Their people were massacred.

Something stirred in the shadows. Chee arched her back, bottled her tail, dropped hand to gun belt. But it was only a beast with several pairs of legs, which ran from her.

The entry, lobby, whatever you wanted to call the section behind the main gate, had been superb, a vista of pillars and fountains and sculpture, exquisitely veined marble and malachite that soared a hundred meters aloft. Now it was an echoing black cave. Sand and nomad rubbish covered the floor; the stonework was chipped, the grand mosaics hidden under soot from centuries of campfires. But when Chee sent a beam upward from her lamp, color glowed back. She activated her impeller and rose for a closer look. Winged things fled, thinly chittering.

The walls were inlaid to the very ceiling. No matter how strange the artistic conventions, Chee could not but respond to an intrinsic nobility. The hues were at once rich and restrained, the images at once heroic and gentle. She did not know what facts or myths or allegories were portrayed; she knew she never would, and that knowledge was an odd small pain. Partly for anodyne, she bent her whole attention to the factual content.

Excitement sprang to life in her. This was the clearest portrayal she

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had ever found of the Old Dathynans. Falkayn was digging up their bones where the ship rested, noting crushed skulls and arrowheads lodged in rib cages. But here, by the lamp's single shaft of light, surrounded by limitless night and cold and wind and beating wings and death, here they themselves looked forth. And a tingle went along Chee Lan's nerves.

The builders were not unlike Shenna. Falkayn could not prove from his relics that they were not as close as Mongoloid is to Negroid on Earth. In their wordless language, these pictures said otherwise.

It was not mere typological difference. You could get a scale from objects that were shown, like still-extant plants and animals. They indicated the ancients were smaller than today's race, none over one hundred eighty centimeters tall, more slender, more hairy, though lacking the male mane. Within those limits, however, many variants appeared. In fact, the section that Chee was looking at seemed to make a point of depicting every kind of autochthon, each wearing native costume and holding something that was most likely emblematic of his or her land. Here came a burly golden-furred long-headed male with a sickle in one hand and an uprooted sapling in the other; there stood a tiny dark female in an embroidered robe, a distinct epicanthic fold in her eyelids, playing a harp; yonder a kilted baldpate with a large and curved muzzle raised his staff, as if in protection, over a bearer of ripe fruits whose face was almost solar in its roundness. The loving spirit and the expert hand which put together this scene had been guided by a scientifically trained eye.

Today one solitary race existed. That was so unusual—so disturbing—that Chee and Falkayn had made it their special business to verify the fact as they slunk about the planet.

And yet the Shenna, altogether distinct in appearance and culture, were shown nowhere on a mosaic which had tried to represent everybody. Nowhere!

A taboo, a dislike, a persecution? Chee spat in contempt of the thought. Every sign pointed to the lost civilization as having been unified and rationalistic. A particular series of pictures on this wall doubtless symbolized progress up from savagery. A nude male was vivdly shown defending his female against a large predatory beast—with a broken branch. Later on, edged metal implements appeared: but always tools, never weapons. Masses of Dathynans were seen working together: never fighting. But this could not be because the topic excluded strife. Two scenes of individual combat did appear; they must be key incidents in a history or legendry forever vanished. The earliest had one male wielding a kind of brush knife, the other an unmis-

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takable wood ax. The second armed the enemies with primitive matchlock guns which were surely intended for help against dangerous animals . . . seeing that the background depicted steam vehicles and electric power lines.

Occupations through the ages were likewise recreated here. Some were recognizable, like agriculture and carpentry. Others could only be guessed at. (Ceremonial? Scientific? The dead cannot tell us.) But hunting was not among them, nor herding except for a species that obviously provided wool, nor trapping, nor fishing, nor butchering.

Everything fitted together with the best clue of all: diet. Intelligence on Dathyna had evolved among herbivores. Though not common, this occurs often enough for certain general principles to be known. The vegetarian sophonts do not have purer souls than omnivores and carnivores. But their sins are different. Among other things, while they may sometimes institutionalize the duello or accept a high rate of crimes of passion, they do not independently invent war, and they find the whole concept of the chase repugnant. As a rule they are gregarious and their social units—families, clans, tribes, nations, or less nameable groups—merge easily into larger ones as communication and transportation improve.

The Shenna violated every such rule. They killed for sport, they divided their planet into patriarchies, they built weapons and warships, they menaced a neighbor civilization which had never given them offense . . . *in short*, thought Chee Lan, *they act like humans. If we can understand what brought them forth, out of this once promising world, maybe we'll understand what to do about them.*

Or, at least, what they want to do about us.

Her communicator interrupted. It was a bone-conduction device, so as not to be overheard; the code clicks felt unnaturally loud in her skull. "Return without delay." Neither she nor Falkayn would have transmitted except in emergency. Chee switched her impeller to lift-and-thrust, and streaked out the doorway.

The stars glittered frigid, the aurora danced in strange figures, the desert rolled stark beneath her. With no hostiles around, and no warning about them near the ship, she lowered her face mask and flew at top speed. Wind hooted and cut at her. That was a long hundred kilometers.

Muddlin' Through lay in the bottom of a dry, brush-grown canyon, hidden from above. Chee slanted past the snags of that minor community on its edge which Falkayn was excavating. Descending into shadow, she switched both her lamp and her goggles to infrared use. There was still no observable reason for caution, but to a carnivore like her it was instinctive.

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Twigs clawed at her, leaves rustled, she parted the branches and hovered before an air lock. Muddlehead's sensors identified her and the valves opened. She darted inside.

"David!" she yelled. "What in Tsucha's flaming name's the matter?"

"Plenty." His intercom voice had never been bleaker. "I'm in the bridge."

She could have flitted along the hall and companionway, but it was almost as quick and more satisfying to use her muscles. Quadrupedal again, tail erect, fangs agleam, eyes a green blaze, she sped through the ship and soared into her chair. "*Niaor!*" she cried.

Falkayn regarded her. Since he didn't sleep while she was out, he wore the dusty coveralls of his day's work, which had begrimed his nails and leathered his skin. A sun-bleached lock of hair hung past one temple. "Word received," he told her.

"What?" She tensed. "Who?"

"Old Nick in person. He's on this planet . . . with Adzel." Falkayn turned his face to the main control board, as if the ship herself lived there. "Read back the message in clear," he ordered.

The phrases fell curt and flat.

They were followed by a silence which went on and on.

At last Chee stirred. "What do you propose to do?" she asked quietly.

"Obey, of course," Falkayn said. His tone was as bare as the computer's. "We can't get the message home too soon. But we'd better discuss first how to leave. Muddlehead keeps getting indications of more and more ships on picket. I suppose the Shenna are finally worried about spies like us. Question is, should we creep out, everything throttled down to minimum, and hope we won't be noticed? Or should we go at full power and rely on surprise and a head start and possible evasive action in deep space?"

"The latter," Chee said. "Our rescue operation will already have alerted the enemy. If we time it right, we can jump between their patrollers and—"

"Huh?" Falkayn sat straight. "What rescue operation?"

"Adzel," Chee said. Her manner was forbearing but her whiskers vibrated. "And van Rijn, no doubt. We have to pick up Adzel, you know."

"No, I do not know! Listen . . ."

"We have squabbled, he and I," Chee said, "but he remains my shipmate and yours." She cocked her head and considered the man. "I always took you for a moral person, Davy."

"Well, but . . . but I am!" Falkayn yelled. "Didn't you listen? Our orders are to start directly for home!"

"What has that got to do with the price of eggs? Don't you want to rescue Adzel?"

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"Certainly I do! If it costs me my own life, I'd want to. But—"

"Will you let a few words from that potgutted van Rijn stop you?"

Falkayn drew a shaken breath. "Listen, Chee," he said, "I'll explain slowly. Van Rijn wants us to abandon him, too. He hasn't even told us where he's at. Since he necessarily used a waveband that would bounce around the planet, he could be anywhere on it."

"Muddlehead," asked Chee, "can you work out the source of his transmission?"

"By the pattern of reflections off the ionosphere, yes, to a fair approximation," answered the computer. "It corresponds to one of the larger communities, not extremely far from here, which we identified as such during our atmospheric entry."

Chee turned back to Falkayn. "You see?" she said.

"You're the one that doesn't see!" he protested. "Adzel and van Rijn aren't important compared to what's at stake. Neither are we. It merely happens they can't warn the League but we can."

"As we shall, after we fetch Adzel."

"And risk getting shot down, or caught ourselves, or—" Falkayn paused. "I know you, Chee. You're descended from beasts of prey that operated alone, or in minimum-size groups. You get your instincts from that. Your world never knew any such thing as a nation. The idea of universal altruism is unreal to you. Your sense of duty is as strong as mine, maybe stronger, but it stops with your kinfolk and friends. All right. I realize that. Now suppose you exercise your imagination and realize what I'm getting at. Hell's balls, just use arithmetic! One life is not equal to a billion lives!"

"Certainly not," Chee said. "However, that doesn't excuse us from our obligation."

"I tell you—"

Falkayn got no further. She had drawn her stun pistol and aimed it between his eyes. He might have attempted to swat it from her, had she been human, but he knew she was too fast for him. He sat frozenly and heard her say:

"I'd rather not knock you out and tie you up. Lacking your help, I may well fail to get our people out. I'll try anyhow, though. And really, Davy, be honest. Admit we have a reasonable chance of pulling the job off. If we didn't, against these Shenn yokels, we ought to turn ourselves in at the nearest home for the feeble-minded."

"What do you want of me?" he whispered.

"Your promise that we'll try our best to take Adzel with us."

"Can you trust me?"

"If not, one of us shall have to kill the other." Her gun remained steady, but her head drooped. "I would hate that, Davy."

He sat a whole minute, unmoving. Then his fist smote the chair

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arm and his laughter stormed forth. "All right, you little devil! You win. It's pure blackmail . . . but Judas, I'm glad of it!"

Her pistol snicked back into its holster. She sprang to his lap. He rubbed her back and tickled her beneath the jaws. Her tail caressed his cheek. Meanwhile she said: "We need their help too, starting with a full description of the layout where they are. I expect they'll refuse at first. Point out to them in your message that they have no choice but to cooperate with us. If we don't go home together, none of us will."

XXIV

Again Chee Lan worked alone. *Muddlin' Through* had come down below the horizon. Other spacecraft stood ahead a pair of destroyers, a flitter, the disabled vessel where the prisoners were kept. Hulls glimmered hoarfrosted in the dying night. Behind them, Moath's stronghold lifted like a mountain. It was very quiet now.

Ghosting from rock to bush to hillock, Chee neared. The guards were said to be a pair. She could make out one, a shaggy-maned shadow, restlessly apace near the barrel of a mobile cannon. His breath smoked, his metal jingled. She strained her eyes, tasted the pre-dawn wind, listened, felt with every hair and whisker. Nothing came to her. Either van Rijn and Adzel had been mistaken in what they related, or the guard's mate had gone off duty without a replacement—or, in an environment for which she was not evolved, she missed the crucial sensory cues.

No more time! They'll be astir in that castle before long. Ay-ah, let's go.

She launched herself across the final sandy stretch. It would have been better to strike from above. But her impeller, like close-range radio conversation with those in the ship, might trip some damned detector. No matter. The sentry was not aware of the white shape that flowed toward him. The instant she came in range, she flattened to earth, drew her stunner and fired. She would rather have killed, but that might be noisy. The supersonic bolt spun the Shenn around on his heel. He toppled with a doomsday racket. Or did he? Sounded like that anyhow. Chee flashed her light at the ship, *blink-blink-blink*. They'd better be watching their screens, those two!

They were. An air lock slid open, a gangway protruded. Adzel came out, himself huge and steel-gray by starlight. On his back, where a dorsal plate had been removed for riders, sat Nicholas van Rijn. Chee bounded to meet them. Hope fluttered in her. If they could really make this break unnoticed—

A roar blasted from the darkness near the warships. A moment later, there sizzled an energy beam. "Get

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going . . . yonder way!" Chee yelled. Her flashbeam pointed toward unseen Falkayn. Whizzing upward on antigrav, she activated her communicator. "We've been seen, Davy." She curved down again, to meet the shooter.

"Shall I come get you?" Falkayn's voice sounded.

"Hold back for a minute. Maybe—" A firebeam stabbed at her. She had been noticed, too. She dodged, feeling its heat, smelling its ozone and ions, half dazzled by its brightness. The Shenn could have taken cover and tried to pick her off, but that was not his nature. He dashed forth. Chee dove at full power, pulled out of her screaming arc a few centimeters above his head, gave him a jolt as she did. He collapsed. She barely avoided smashing into the ship before her.

Alarms gonged through the castle. Its black mass woke with a hundred lights. Shenna streamed from the gate. Most were armed; they must sleep with their cursed weapons. Four of them were donning flit-harness. Chee headed after Adzel's galloping form. He couldn't outrun such pursuers. She'd provide air cover . . .

"What's wrong?" Falkayn barked. "Shouldn't I come?"

"No, not yet. We'll keep you for a surprise." Chee unholstered her own blaster. Enough of these la-de-da stun pistols. The enemy were aloft, lining out after Wodenite and human. They hadn't noticed her. She got altitude on them, aimed, and fired twice. One crashed, in a cloud of dust. The other flew on, but did not stir any longer save as the wind flapped his limbs.

The third angled after her. He was good. They started a dogfight. She could do nothing about the fourth, who stooped upon the escapers.

Adzel slammed to a halt, so fast that van Rijn fell off and rolled yammering through the thornbushes. The Wodenite picked up a rock and threw. It struck with a clang. Impeller disabled, the Shenn fluttered to the ground.

His mates, incredibly swift on their feet, were not far behind. They opened fire. Adzel charged them, bounding from side to side, taking an occasional bolt or bullet in his scales but suffering no serious wound. He was mortal, of course. A shot sufficiently powerful or sufficiently well-placed would kill him. But he got in among the Shenna first. Hoofs, hands, tail, fangs ripped into action.

The downed flier was not badly hurt either. He saw his gun lying where he had dropped it and ran to retrieve the weapon. Van Rijn intercepted him. "Oh, no, you don't, buddy-chum," the merchant panted. "I take that thing home and see if you got new ideas in it I can patent." Taller, broader, muscles like cables, the minotaur sprang at the fat old man. Van Rijn wasn't

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there any more. Somehow he had flicked aside. He delivered a karate kick. The Shenn yelled. "Ha, is a tender spot for you, too?" van Rijn said.

The Dathynan circled away from him. They eyed each other, and the blaster that sheened on the sand between them. The Sheen lowered his head and charged. Knowing he faced an opponent with some skill, he kept his hands in a guarding position. But no Earthling would survive on whom they closed. Van Rijn sped to meet him. At the last breath before collision, he sidestepped again, twirled, and was at the back of the onrushing giant warrior. "God send the right!" bawled van Rijn, reached into his tunic, drew forth St. Dismas, and sapped his foe. The Shenn went down.

"Whoo-hoo," van Rijn said, blowing out his cheeks above the dazed colossus. "I'm not so young like I used to be." He returned the statuette to its nesting place, collected the gun, studied it until he had figured out its operation, and looked around for targets.

There were none immediately on hand. Chee Lan had overcome her adversary. Adzel trotted back. The Shenn mob was scattered, fleeing toward the castle. "I hoped for that result," the Wodenite remarked. "It accords with their psychology. The instinct to assail rashly should, by and large, be coupled with an equal tendency to stampede. Otherwise the ancestral species could not long have survived."

Chee descended. "Let's travel before they gather their wits," she said.

"*Ja,* they isn't really stupids, them, I am afraid," van Rijn said. "When they tell their robots to stop loafing—"

A deep hum cut through the night. One of the destroyers trembled on her landing jacks. "They just did," Chee said. Into her communicator: "Come and eat them, friends."

Muddlin' Through soared above the horizon. "Down!" Adzel called. He sheltered the other two with his body, which could better stand heat and radiation.

Beams flashed. Had either warcraft gotten off the ground, Falkayn and Muddlehead would have been in trouble. Their magazines were depleted after the battle of Satan. But they were forewarned, warmed up, ready and ruthless to exploit the advantage of surprise. The first destroyer loosed no more than a single ill-aimed shot before she was undercut. She fell, struck her neighbor, both toppled with an earthshaking metal roar. The League vessel disabled Moath's flitter—three bolts were needed, and the sand ran molten beneath—and landed.

"*Donder op!*" van Rijn cried. Adzel tucked him under one arm. "*Wat drommel?*" he protested. The

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Wodenite grabbed Chee by the tail and pounded toward the air lock.

He must squint into lightning dazzle, stagger from thunders, gasp in smoke and vapor, as the ship bombarded the castle. In the bridge, Falkayn protested: "We don't want to hurt noncombatants."

Muddlehead replied, "In conformity with your general directive, I am taking the precaution of demolishing installations whose radio resonances suggest that they are heavy guns and missile racks."

"Can you get me through to somebody inside?" Falkayn asked.

"I shall tune in what we have noted as the usual Dathynan communication bands . . . Yes. An attempt is being made to call us."

The screen flickered. Streaked, distorted, static-crazed, the image of Thea Beldaniel appeared. Her face was a mask of horror. Behind her, the room where she sat trembled and cracked under the ship's blows. By now, Falkayn could no longer see the castle facade. Nothing showed but dust, pierced through and through by the nuclear flames and the bursting shells. His skull shivered; he was himself half deafened by the violence he unleashed. Faintly he heard her: "Davy, Davy, are you doing this to us?"

He gripped the arms of his chair and said through clenched jaws: "I didn't want to. You force me. Listen, though. This is a taste of war for you and yours. The tiniest, gentlest, most carefully administered dose of the poison we can give. We're bound away soon. I'd hoped to be far off before you realized what'd happened. But maybe this is best. Because I don't think you can summon help from elsewhere in time to catch us. And you know what to expect."

"Davy . . . my lord Moath . . . is dead . . . I saw a bolt hit him, he went up in a spurt of fire—" She could not go on.

"You're better off without a lord," Falkayn said. "Every human being is. But tell the others. Tell them the Polesotechnic League bears no grudge and wants no fight. However, if we must, we will do the job once for all. Your Shenna won't be exterminated; we have more mercy than they showed the Old Dathynans. But let them try resisting us, and we'll strip the machinery from them and turn them into desert herders. I suggest you urge them to consider what terms they might make instead. Show them what happened here and tell them they were fools to get in the way of freemen!"

She gave him a shattered look. Pity tugged at him, and he might have said more. But Adzel, Chee Lan, Nicholas van Rijn were aboard. The stronghold was reduced: with few casualties, he hoped, nevertheless a terrible object lesson. He cut his transmission. "Cease barrage," he ordered. "Lift and make for Earth."

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XXV

"There has been no trace of any hyperdrive except our own for a continuous twenty-four hours," Muddlehead reported.

Falkayn gusted a sigh. His long body eased into a more comfortable position, seated half on the spine, feet on the saloon table. "I reckon that settles it," he smiled. "We're home safe."

For in the illimitable loneliness that reaches between the stars, how shall a single mote be found, once it has lost itself and the lives it carries? Dathyna's sun was no more than the brightest glitter in those hordes that filled the cabin viewscreens. The engines murmured, the ventilators blew odors suggesting flowery meadows, tobacco was fragrant, one could look for peace throughout the month of flight that lay ahead.

And Judas, but they needed a rest!

A point of anxiety must first be blunted. "You're sure you didn't take undue radiation exposure while you were outside?" Falkayn asked.

"I tell you, I have checked each of us down to the chromosomes," Chee snapped. "I *am* a xenobiologist, you know . . . you do know, don't you? . . . and this vessel is well-equipped for that kind of studies. Adzel got the largest dose, because he shielded us, but even in his case, no damage was done that available pharmaceuticals will not repair." She turned from her curled-up placement on a bench, jerked her cigarette holder at the Wodenite where he sprawled on the deck, and added: "Of course, I shall have to give you your treatments en route, when I might be painting or sculpting or— You big slobbersoul, why didn't you bring a chunk of lead to lie under?"

Adzel leered. "You had all the lead in your own possession," he said. "Guess where."

Chee sputtered. Van Rijn slapped the table—his beer glass leaped—and guffawed: *"Touché!* I did not think you was a wit."

"That's wit?" the Cynthian grumbled. "Well, I suppose for him it is."

"Oh, he needs to learn," van Rijn conceded, "but what makes matter is, he has begun. We will have him play at drawing-room comedies yet. How about in 'The Importance of Being Earnest'? Haw!"

The merchant's classical reference went by the others. "I'd suggest a party to celebrate," Falkayn said. "Unfortunately—"

"Right," van Rijn said. "Business before pleasure, if not too bloomering long before. We should assemble our various informations while they is fresh in our minds, because if we let them begin to rot and stink in our minds, we could lose parts of what they imply."

"Huh?" Falkayn blinked. "What do you mean, sir?"

Van Rijn leaned forward, cra-

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dling his chins in one great paw. "We need keys to the Shenn character so we know how to handle them."

"But isn't that a job for professionals?" inquired Adzel. "After the League has been alerted to the existence of a real threat, it will find ways to carry out a detailed scientific study of Dathyna and draw conclusions much more certain and complete than we possibly could on the basis of our data."

"Ja, ja, ja," van Rijn said, irritated, "but our time is shortening. We don't know for sure what the Shenna do next. Could be they decide they will attack fast as they possible can, try and beat us to the rum punch, in spite of what you taught them, Muddlehead."

"I was not programmed to deliver formal instruction," the computer admitted.

Van Rijn ignored it. "Maybe they don't be that suicidal," he went on. "Anyhowever, we got to have some theory about them to start on. Maybe it is wrong, but even then it is better than nothing, because it will set xenological teams looking for something definite. When we know what the Shenna want in their bottom, then we can talk meaningful to them and maybe make peace."

"It is not for me to correct a Terrestrial's use of Terrestrial idiom," Adzel said, "but don't you wish to discuss what they *basically* want?"

Van Rijn turned red. "Hokay, hokay, you damn pedagoggle! What is the base desires of the Shenna? What drives them, really? We get insight—oh, not scientific, Chee Lan, not in formulas—but we get a feel for them, a poet's empathizing, and they is no longer senseless monsters to us but beings we can reason with. The specialists from the League can make their specials later. Time is so precious, though. We can save a lot of it, and so maybe save a lot of lives, if we bring back with us at Earth a tantivy . . . a tentacle . . . *dood ook ondergang*, this Anglic! . . . a tentative program for research and even for action."

He drained his beer. Soothed thereby, he lit his pipe, settled back, and rumbled: "We got our experience and information. Also we got analogues for help. I don't think any sophonts could be total unique, in this big a universe. So we can draw on our understanding about other races.

"Like you, Chee Lan, for instance: we know you is a carnivore —but a small one—and this means you got instincts for being tough and aggressive within reason. You, Adzel, is a big omnivore, so big your ancestors didn't never need to carry chips on their shoulders, nor fish either; your breed tends more to be peaceful, but hellish independent too, in a quiet way; somebody tries for dictating your life, you don't kill him like Chee would, no, you

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plain don't listen at him. And we humans, we is omnivores, too, but our primate ancestors went hunting in packs, and they got built in a year-around sex drive; from these two roots springs everything what makes a man a human being. Hokay? I admit this is too generalistic, but still, if we could fit what we know about the Shenna in one broad pattern—"

Actually, the same idea had been germinating in each of them. Talking, they developed several facets of it. These being mutually consistent, they came to believe their end result, however sketchy, was in essence true. Later xenological studies confirmed it.

Even a world like Earth, blessed with a constant sun, has known periods of massive extinction. Conditions changed in a geological overnight, and organisms that had flourished for megayears vanished. Thus, at the end of the Cretaceous, ammonites and dinosaurs alike closed their long careers. At the end of the Pliocene, most of the large mammals—those whose names, as bestowed afterward, usually terminate in *-therium*—stopped bumbling across the landscape. The reasons are obscure to this day. The raw fact remains: existence is precarious.

On Dathyna, the predicament was worse. The solar bombardment was always greater than Earth receives. At the irregular peaks of activity, it was very much greater. Magnetic field and atmosphere could not ward off everything. Belike, mutations which occurred during an earlier maximum led to the improbable result of talking, dreaming, tool-making herbivores. If so, a cruel natural selection was likewise involved: for the history of such a planet must needs be one of ecological catastrophes.

The next radiation blizzard held off long enough for the race to attain full intelligence; to develop its technology; to discover the scientific method; to create a world-wide society which was about to embark for the stars, had perhaps already done it a time or two. Then the sun burned high again.

Snows melted, oceans rose, coasts and low valleys were inundated. The tropics were scorched to savannah or desert. All that could be survived. Indeed, quite probably its harsh stimulus was what produced the last technological creativity, the planetary union, the reaching into space.

But again the assault intensified. This second phase was less an increase of electromagnetic energy, heat and light, than it was a whole new set of process, triggered when a certain threshold was passed within the waxing star. Protons were hurled forth; electrons; mesons; X-ray quanta. The magnetosphere glowed with synchrotron radiation, the upper atmosphere with secondaries. Many life forms must have

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died within a year or two. Others, interdependent, followed them. The ecological pyramid crumbled. Mutation went over the world like a scythe, and everything collapsed.

No matter how far it had progressed, civilization was not autonomous. It could not synthesize all its necessities. Crop lands became dustbowls, orchards stood leafless, sea plants decayed into scum, forests parched and burned, new diseases arose. Step by step, population shrank, enterprises were abandoned for lack of personnel and resources, knowledge was forgotten, the area of the possible shrank. A species more fierce by nature might have made a stronger effort to surmount its troubles—or might not—but in any event, the Dathynans were not equal to the task. More and more of those who remained sank gradually into barbarism.

And then, among the barbarians, appeared a new mutation.

A favorable mutation.

Herbivores cannot soon become carnivores, not even when they can process meat to make it edible. But they can shed the instincts which make them herd together in groups too large for a devastated country to support. They can acquire an instinct to hunt the animals that supplement their diet—to defend, with absolute fanaticism, a territory that will keep them and theirs alive —to move if that region is no longer habitable, and seize the next piece of land—to perfect the weapons, organization, institutions, myths, religions, and symbols necessary—

—To become killer herbivores.

And they will go further along that line than the carnivora, whose fang-and-claw ancestors evolved limits on aggressiveness lest the species dangerously deplete itself. They might even go further than the omnivora, who, while not so formidable in body and hence with less original reason to restrain their pugnacity, have borne arms of some kind since the first proto-intelligence developed in them, and may thus have weeded the worst berserker tendencies out of their own stock.

Granted, this is a very rough rule-of-thumb statement with many an exception. But the idea will perhaps be clarified if we compare the peaceful lion with the wild boar who may or may not go looking for a battle and him in turn with the rhinoceros or Cape buffalo.

The parent stock on Dathyna had no chance. It could fight bravely, but not collectively to much effect. If victorious in a given clash, it rarely thought about pursuing; if defeated, it scattered. Its civilization was tottering already, its people demoralized, its politico-economic structure reduced to a kind of feudalism. If any group escaped to space, they never came back looking for revenge.

A gang of Shenna would invade an area, seize the buildings, kill and

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eat those Old Dathynans whom they did not castrate and enslave. No doubt the conquerors afterward made treaties with surrounding domains, who were pathetically eager to believe the aliens were now satisfied. Not many years passed, however, before a new land-hungry generation of Shenna quarreled with their fathers and left to seek their fortunes.

The conquest was no result of an overall plan. Rather, the Shenna took Dathyna in the course of several centuries because they were better fitted. In an economy of scarcity, where an individual needed hectares to support himself, aggressiveness paid off; it was how you acquired those hectares in the first place and retained them later. No doubt the sexual difference, unusual among sophonts, was another mutation which, being useful too, became linked. Given a high casualty rate among the Shenn males, the warriors, reproduction was maximized by providing each with several females. Hunting and fighting were the principal jobs; females, who must conserve the young, could not take part in this; accordingly, they lost a certain amount of intelligence and initiative. (Remember that the original Shenn population was very small, and did not increase fast for quite a while. Thus genetic drift operated powerfully. Some fairly irrelevant characteristics like the male mane became established in that way—plus some other traits that might actually be disadvantageous, though not crippling.)

At length the parricidal race had overrun the planet. Conditions began to improve as radiation slacked off, new life forms developed, old ones returned from enclaves of survival. It would be long before Dathyna had her original fertility back. But she could again bear a machine culture. From relics, from books, from traditions, conceivably from a few last slaves of the first species, the Shenna began rebuilding what they had helped destroy.

But here the peculiar set of drives which had served them well during the evil millennia, played them false. How shall there be community, as is required for a high technology, if each male is to live alone with his harem, challenging any other who dares enter his realm?

The answer is that the facts were never that simple. There was as much variation from Shenn to Shenn as there is from man to man. The less successful had always tended to attach themselves to the great, rather than go into exile. From this developed the extended household—a number of polygynous families in strict hierarchy under a patriarch with absolute authority—that was the "fundamental" unit of Shenn society, as the tribe is of human, the matrilineal clan of Cynthian, or the migratory band of Wodenite society.

The creation of larger groups out of the basic one is difficult on any

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planet. The results are all too likely to be pathological organizations, preserved more and more as time goes on by nothing except naked force, until finally they disintegrate. Consider, for example, nations, empires, and world associations on Earth. But it need not always be thus.

The Shenna were reasoning creatures. They could grasp the need for cooperation intellectually, as most species can. If they were not emotionally capable of a planet-wide government, they were of an interbaronial confederacy.

Especially when they saw their way clear to an attack—the Minotaur's charge—upon the stars!

"*Ja,*" nodded van Rijn, "if they are like that, we can handle them hokay."

"By kicking them back into the Stone Age and sitting on them," Chee Lan growled.

Adzel raised his head. "What obscenity did you speak? I won't have it!"

"You'd rather let them run loose, with nuclear weapons?" she retorted.

"Now, now," said van Rijn. "Now, now, now. Don't let's say bad things about a whole race. I am sure they can do much good if they is approached right." He beamed and rubbed his hands together. "Sure, much fine money to make off them Shenna." His grin grew broader and smugger. "Well, friends, I think we finished our duty for today. We has clubbed our brains and come up with understandings and we deserve a little celebration. Davy, lad, suppose you start by bringing in a bottle Genever and a few cases of beer—"

Falkayn braced himself. "I tried to tell you earlier, sir," he said, "that brew you drank was the end of our supply."

Van Rijn's eyes threatened to leap from their sockets.

"This ship left Luna without taking on extra provisions," Falkayn said. "Nothing aboard except the standard rations. Including some beverages, of course . . . but, well, how was I to know you'd join us and—" His voice trailed off. The hurricane was rising.

"Wha-a-a-at?" Echoes flew around van Rijn's scream. "You mean . . . a month in space . . . and nothings for drinking except—*Not even any beer?*"

The next half hour was indescribable.

XXVI

But half an Earth year after that—

Chandra Mahavany, Assistant Minister of Foreign Relations of the Terrestrial Commonwealth, looked out at the ocher-and-gold globe which the battleship was orbiting, and back again, and said indignantly: "You cannot do it! You, a mere mutual-benefit alliance of

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. . . of capitalists . . . enslaving a species, a world!"

Fleet Admiral Wiaho of the Polesotechnic League gave him a chill stare. "What do you think the Shenna were planning to do to us?" He was born on Ferra; saber tusks handicapped him in speaking human languages. But his scorn was plain to hear.

"You hadn't even the decency to notify us. If Freeman Garver's investigations had not uncovered evidence strong enough to bring me here in person—"

"Why should the League consult the Commonwealth, or any government?" Wiaho jerked a claw at Dathyna, where it spun in the viewscreen. "We are quite beyond their jurisdictions. Let them be glad that we are dealing with a menace and not charging them for the service."

"Dealing?" Mahavany protested. "Bringing an overwhelming armada here . . . with no overt provocation . . . forcing those poor, ah, Shenna to surrender everything they worked so hard to build, their space fleet, their key factories . . . tampering with their sovereignty . . . reducing them to economic servitude—do you call that dealing with the situation? Oh, no, sir. I assure you otherwise. It is nothing but the creation of a hatred which will soon explode in greater conflict. The Commonwealth government must insist on a policy of conciliation. Do not forget, any future war will involve us, too."

"Won't be any," Wiaho said. "We're seeing to that. Not by 'enslavement,' either. I give you, *zugaya*, we have taken the warmaking capability out of their hands, we supervise their industry, we weave their economy together with ours till it cannot function independently. But the precise reason for this is to keep revanchism from having any chance of success. Not that we expect it to arise. The Shenna don't deeply resent being ordered about —by someone who's proven to them he's stronger."

A human female passed by the open door, memotape in one hand. Wiaho hailed her. "Would you come in for a minute, pray? Freelady Beldaniel, Freeman Mahavany from Earth. Freelady Beldaniel is our most valuable liaison with the Shenna. She was raised by them, have you heard? Don't you agree, what the League is doing is best for their entire race?"

The thin, middle-aged woman frowned, not in anger but in concentration. "I don't know about that, sir," she answered frankly. "But I don't know what better can be done, either, than turn them into another member of Technic civilization.The alternative would be to destroy them." She chuckled. On the whole, she must enjoy her job. "Seeing that the rest of you insist on surviving, too."

"But what about the economics?" Mahavany protested.

"Well, naturally we cannot oper-

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ate for nothing," Wiaho said. "But we are not pirates. We make investments, we expect a return on them. Remember, though, business is not a zero-sum game. By improving this world, we benefit its dwellers."

Mahavany flushed. "Do you mean . . . your damned League, sir, has the eternal gall to arrogate to itself the functions of a government?"

"Not exactly," Wiaho purred. "Government couldn't accomplish this much." He uncoiled his length from the settee he occupied. "Now, if you will excuse Freelady Beldaniel and myself, we have work to do."

On Earth, in a garden, van Rijn turned from the screen on which was projected a view brought home by the latest expedition to Satan. He smiled unctuously at a boardful of lesser screens, wherein showed human and nonhuman faces, the mightiest industrialists in the known galaxy.

"Hokay, friends," he said, "you seen what I got a full clear claim on, namely you by the short hairs. However, I is a tired old man what mainly wants only sitting in the sun scratching his memories and having maybe just one more Singapore sling before evening—and anyhows is a dealer in sugar and spice and everything nice, not in dark Satanic mills. I don't want no managing for myself, on this fine planet where is money to make by the shipload every second. No, I will be happy with selling franchises . . . naturally, we make a little profit-sharing arrangement, too; nothing fancy, a token like maybe thirty or forty percent of net . . . I is very reasonable. You want to start bidding?"

Beyond the Moon, *Muddlin' Through* accelerated outward. Falkayn looked long in the after screen. "What a girl she was," he said.

"Who, Veronica?" Chee asked.

"Well, yes. Among others." Falkayn lit his pipe. "I don't know why we're starting out again, when we're rich for life. I honestly don't."

"I know why you are," Chee said. "Any more of the kind of existence you've been leading, and you'd implode." Her tail switched. "And me, I grew bored. It'll be good to get out under fresh skies again."

"And find new enlightenments," Adzel said.

"Yes, of course," Falkayn said. "I was joking. It sounded too pretentious, though, to declaim that the frontier is where we belong."

Muddlehead slapped down a pack of cards and a rack of poker chips onto the table, with the mechanical arms which had been installed for such purposes. "In that event, Captain," it said, "and pursuant to the program you outlined for us to follow during the next several hours, it is suggested that you shut up and deal." ■

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Joe Poyer **SPECIALTY**

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Some men have a natural born specialty

even if it's not quite what that talent was evolved for . . .

Illustrated by Kelly Freas

Tupac Araptha topped the rise, stopped the tractor and swung out of the unpressurized cabin. The narrow pass up which he had just climbed funneled between low hills and poured out onto a lava plain that flowed north to butt against the rugged, sunlit spires of the Independence Mountains fifteen miles away. Nestled against the feet of the range, Tupac could just make out the clustered domes of the Lunar Republic. He checked the chronometer built into the wrist band of his pressure suit. Two minutes or so yet if they were on time.

The gray plain showed the now well-beaten road that led south from the base site to the pass. With the sun backlighting the area, the indented lines of passing tractor treads were twin threads of black against the lava glare. Then, momentarily, he caught a flicker of haze against the shaded mountain slopes and seconds later the shuttle lifting slowly for orbit.

Tupac had left the main base two hours earlier in the unpressurized tractor that had lately been obtained from the Americans as part of the United States Lunar Base Lease Agreement. As he left, the crew had been loading the Soviet shuttle with the monthly shipment of "aged" brandy for the Swiss distributor and the Earthside snob market; those willing to pay two thousand dollars a quart for real "moonshine." A minor market in terms of volume, but important because it brought in ninety-five percent of the Lunar Republic's hard dollars—nearly eight thousand a month—even after the sky-high freight charges were deducted. Satisfied that this month's shipment was safely into the first stage of its sojourn, Tupac climbed back into the tractor and fed power to the tracs to begin the long descent to the ore beds thirty miles south.

It was not until he had passed the stone cairn, marking the half-

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way point, that it finally occurred to Tupac that he was beginning to take an almost proprietary interest in the Lunar Republic; in this ridiculous proposition that a handful of men could wrest a life-sustaining ecology from an airless planetoid. Fifteen men, not counting himself, were now citizens of the Republic less than two years after its declaration of independence, yet those fifteen men had defied a world govment, the law of averages, common sense, and were now almost ecologically independent on the Moon. He shook his head at the notion. He just might seriously consider Dillon's offer after all, he decided.

An hour later, the pass leveled then began its final downhill drop. From this vantage point, he could see the wide pocked plain that was Mare Frigoris stretching south to the mountainlike walls of the Aristoteles Crater. It was close to Lunar high noon, but in these arctic reaches, the sun was only slightly higher in the star-flecked sky than at any other time of the day. The temperature thermocouple registered a steady 237° F. which fluctuated only when he passed through a shadow cast by a rock outcropping, or the cliffs on either side of the pass shut out the heat of the sun. Then, the temperature plummeted instantly to −243° F. To the southeast, he could just barely glimpse the northern walls of the Alpine Valley slanting across the southern horizon to form an as-yet unexplored canal into the interior of Mare Imbrium. From this height, nearly a thousand feet above the arbitrary sea level, the moon lay spread before him in all its glory and color, dominated by the molten white and blacks dictated by the naked sun.

Tupac stopped a final time for a long, searching look at the panoramic view. For the next two weeks until the ore beds were dug and the processing plant in operation, he would be stuck on the beaches of Mare Frigoris with only the flat immensity of the Sea of Cold and the perpendicular walls of the Sheepshanks before and behind.

Galileo had not been so far wrong after all when he named these flat lands *seas*. They held water all right, but water locked away in the crystalline structure of the broken volcanic rock debris. Enough water to flood the entire surface of the Moon to a depth of fifteen feet if it could be gotten at. And that was what held him in such a state of excitement. They could and were going to unlock at least some of the billions of tons of water.

Grinning to himself, he started the tractor forward again and approached the sharp right turn in the trail, dictated by the placement of a cracked boulder tumbled down from the heights eons ago.

"Someday I'm going to bring up some explosives and drop that thing into the canyon," he said to no one

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in particular and fed power to the trac motors. The vehicle lurched to starboard, hung poised for a second over vacuum, then swung delicately into the turn as the treads bit in again. Beyond that point, the trail began to level and shortly he was down on the plain with the pressure dome of the mining base less than a mile away.

As he came 'round the dome and headed into the tractor park, he could see the large four-man pressurized tractor struggling mightily in the low gravity to pile up deep bladefulls of soil against the dome. Hank Carter, the explosives expert and Jim Robertson, the Republic's only geologist and the youngest of the four, were shoveling the dirt in long, slow sweeps onto the top of the dome. That meant that Kelly Rand was driving. Tupac watched the expert way that Kelly handled the big tractor as he trundled it back with the blade raised, selected the next strip, then dropped the blade to break up the cohesiveness of the soil particles. The tank lurched, treads slipping, then grunted forward, pushing the soil ahead to where the two men were shoveling. They were a good team, he thought. Each skilled in his own trade. But three weeks of living in a twenty-foot diameter dome with no escape from one another was beginning to rub them raw.

When Matt Dillon had made the run to Copernicus with the latest supply of liquor—too precious to be trusted to the flimsy ballistic cargo rockets that were normally used to deliver supplies—Tupac Araptha had been very curious about the man. He, as well as literally everyone on Earth knew the story of this partner in the Lunar Republic who had defied the United Nations and laid claim to the Moon He had followed with interest the legal battle that had developed in the World Court as the United Nations had fought to invalidate their claim. In the first court bout, it had become obvious this was a precedent-setting case to top all precedents. The ultimate fate of the Republic would be tied up in litigation for years to come, if the hostile Moon did not kill or drive away the arrogant settlers first.

Tupac was a sometimes student of history and a firm believer in the theory that from time to time certain men appear who are capable of recognizing the optimum mix of events, politics and socioeconomic conditions and so take advantage of a particular situation as to appear to influence history. Tupac was fascinated. And he was not disappointed on meeting Dillon to find out that he was really the happy-go-lucky character he appeared—and hard as nails underneath. Later, when he met Robert Thompson, the original partner, he appreciated what other commentators had already seen; that Thompson had set out to prove a point, and having

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proved that point, that man could both buck the *system* and wrest an existence from the sterile face of the Moon, was content to let Dillon take over the organization and "foreign affairs" while he puttered with new ideas to make his Republic an entirely closed ecological system. As Dillon had explained it during their first talks while sitting in the magnificent lounge the Soviets had created—a wide window set so to overlook the interior of Copernicus Crater from a vantage point on the south rim—Thompson was responsible for the idea that would give the Republic its first treasury surplus.

"So far, we've managed to break-even on exploration base lease rights to both the United States and the Soviet Union. The liquor business here on the Moon pays for necessities, like certain foods he can't quite coax along in that Model T hydroponic farm, and meats. Other goodies come out of the liquor export trade Earthside. But this latest idea beats them all."

"So?" Tupac had inquired politely.

"So is right, and that's where you come in."

"Me?"

"You! Look, we need a mining engineer with a geology background—or would selenology be a better term? Anyway, someone who knows both prospecting and digging." He paused to glance at Tupac who returned the stare impassively.

"In front of our pressure dome," Dillon continued, "is a small bed of carbonates. They are supposed to be rich in oxygen and hydrogen, water in other words—at least to us. You know more about that stuff than I do. Anyway, Bob picked the particular spot where the base is now for just that reason. All he had to do was step outside the front door and he could get all the chemicals to feed the algae O_2 system he needed. From the algae he could produce food and oxygen."

Tupac nodded soberly. "And liquor."

Dillon flashed him a quick grin. "Yeah," then continued. "Now, Bob's latest idea is to break out the water, electrolyze it to hydrogen and oxygen, liquefy and sell both to the Yanks and the Russkies for fuel, air, water or whatever other use they can find for hydrogen and oxygen. Do you realize how much that would save both bases if they could buy fuel right here instead of shipping it up from Earth?"

Tupac did some quick mental calculations. "I don't know what your production costs would be," he answered slowly, "but at the current one thousand dollars a pound from Earth surface to lunar surface, you should have no trouble beating that price."

Dillon looked at him, eyes snapping with excitement. "You bet your sweet life. Think beyond that. Can you see what this ultimately means? We could not only supply

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fuel for the lunar shuttles, but for the orbit-to-orbit shuttles and even the Earth space stations as well. With our smaller gravity well, we can easily beat even the five hundred dollars per pound surface to one hundred nautical mile orbit price tag by at least three hundred fifty dollars per pound. That would encourage more exploration, more bases, and more people. Launch costs from lunar surface to Earth orbit run about one hundred dollars per pound. Now we can sell all . . ."

"You mean to tell me you can produce and liquefy hydrogen and oxygen for fifty dollars a pound!" He stared at Dillon as if he were a roaring madman.

"Sure! Hell, I don't know anything about the technicalities. I'm just a lawyer. You'll have to talk to Kelly Rand, our chief engineer about that. He says it can be done. And he and Bob designed some kind of system to do it."

"Fifty dollars a pound." Tupac sagged back in the chair. "I don't believe it. You will put Linde Carbide & Yahotchov Gases out of business in a year, so far as in-space applications are concerned."

"Yeah," Dillon chortled. "And that was only a prototype rig. Production runs should get down to twenty-eight bucks a pound they tell me."

Tupac found he could do nothing but sit shaking his head for several minutes trying to absorb what Dillon was telling him. And these nuts just might be able to do it too, he thought. Surely, if their past record of accomplishing the impossible was any indication, they certainly could. Finally he asked weakly, "You said the original bed Mr. Thompson had located was pretty small. Have you found others?"

"One other," Dillon answered, sobering. "It's about thirty miles south of the base site at the foot of the Sheepshanks. It looks pretty extensive." Dillon leaned forward and tapped his finger on the samovar in time with his measured words. "But we need you to tell us how big . . . and to find others."

Tupac stared past Dillon's shoulder and down into the twisted depths of Copernicus. "I don't know," he said finally. "Why me in particular? There are about fifteen others both here and at the American base, much better qualified than I am . . ."

"Except in one respect," Dillon interrupted. "Bob and I, and the rest of us at the Base have tried this exploration bit. We, or I should say they, have been on the Moon longer than anyone else . . . I've spent too much time on Earth lately playing patty-cake with the U.S."

"Pretty successfully, too, it seems," Tupac interjected, trying to slow the pace down to have time to think.

"Yeah, so far. I keep telling them we have a secret weapon up

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here and if they don't play ball I'll sterilize everybody in U.N. Headquarters. Scares hell out of 'em," he grinned. "But anyway, like I said, we've all tried it and we all run into the same problem. We just aren't built for this type of stress. We can't run around long enough in a pressure suit to accomplish anything. Talk acclimatizing all you want, but our generation—having lived most of our lives on Earth—will never adjust to the low atmospheric pressure. It just produces too great a physiological strain. Maybe our kids will—if they are born and grow up here—but we won't."

Tupac was listening intently now. He knew what was coming next. The Russians had made the same pitch when they first approached him almost a year ago. Tupac Araptha had a tremendous edge over the rest of the men on the Moon. He was an Alto Plano Amerind, born in a little village called Tezon, at 16,875 feet on the slopes of the Andes. Most of his life had been spent at this and higher altitudes. When he graduated from high school, the Peruvian Air Force had picked him for pilot training and after four years in the service, he had spent an additional four years in the United States studying mining and geology, almost his only experience at sustained low altitude and he found he didn't like it. So, he had gone happily back to the Andes as a field geologist for a Peruvian/U.S./French mining consortorium. That had lasted until nearly a year and a half ago when the Russians, accompanied by his old commanding officer, had shown up at the mine. The Russians flatly offered him a place on the crew at the new Copernicus Base after seeing him run 800 meters in 1'55" at 15,558 feet. The contract was for one year and included a fat fee to become an experimental test subject. He had accepted, but not without misgivings. As much as he hated to admit it, he loved the rugged Andes and the Amerind peasants who in less than two decades had made the complicated jump from near stone-age rural society to complicated Twentieth Century life.

Tupac had listened, well aware of the problem of trying to accomplish sustained work in a pressure suit breathing only oxygen at 3.5 psi. Humans reared in the Earth normal atmospheric pressure of 14.7 pounds per square inch found little difficulty in breathing the 10 psi mixed gas system used in the lunar settlements. Space, or pressure suits were another matter entirely. They had to be pressurized to 3.5 psi of *oxygen* only. Thus, while the oxygen available was a little over half a pound per *square inch* higher than the normal sea level pressure of 2.9 psi, the pressures tending to force the suit rigid were also higher. At 3.5 psi, internal suit pressure, the wearer had to work against 504

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pounds per *square foot* on the inside of the suit! Even with the ingenious joints engineered for the knees, elbows, and torso, great exertion was required on the part of the wearer for every movement. The man wearing the suit in a vacuum, if raised at or near sea level, had to work several times harder for every movement and became exhausted too seen to accomplish a very significant amount of work. Since muscle fatigue is a function of CO_2 and lactic acid buildup in the tissue, the normal heart copes by increasing its pumping rate to supply more oxygen. The rate of oxygen exchange thus becomes the critical factor.

The Alto Plano with his centuries of high altitude acclimatization has developed differing enzymes affecting his blood chemistry that allows the hemoglobin molecule to absorb more O_2 from the available supply. In addition, Tupac, born and raised at 16,875 feet in the Peruvian Andes, normally breathes an atmosphere of seven pounds per square inch with an O_2 partial pressure of 1.5 psi. His suit pressurization could be lowered from 3.5 to 1.5 psi which meant that he had only to work against 216 pounds per square foot.

The Soviets, well aware of this, had brought him to their lunar base at Copernicus for dynamic testing. And now, with his contract almost expired, Dillon was offering him a chance to prove the experimental work under actual—and useful—work conditions. He had accepted Dillon's offer on a trial basis with some misgivings but, the more time he spent in the pioneering colony, the more he was growing to like it.

Bucking the tractor over the freshly gouged-out areas, Tupac approached the pressure tent and ground to a halt. He kicked open the hatch and slid gracefully out and trudged over to where the others were working. As he approached, he noted with a critical eye that a fairly wide patch had been scraped free right down to the bedrock. The sand had been carefully banked around the heavy plastic tent except for the shadowed portion to the rear. Carter and Robertson were both standing on the top of the pile, shoveling sand onto the dome of the pressure tent for insulation. As he approached, both men jammed their shovels into the sand and clambered down. Tupac could feel the faint vibrations of the heavy tractor through the soles of his boots as it struggled with another load of sand.

Carter finished the short descent in a half run, half hop and trudged toward him, followed by Robertson.

"Hey, look, if it ain't South

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America's answer to Geronimo," he called out wearily. "What goes in pioneer town?"

Tupac waved a net bag. "They sent along a couple of flasks for you miners. Everything was fine when I left. The new steam plant was finally working properly and Dillon signed the agreement with the Russians for gas delivery. When I left, the Americans had just arrived and very unhappy because the Russians were forcing them into buying our gas as well."

"That's good, a little competition never hurt anyone," Kelly broke in, "Glad you made it back, Tupac." All suits were on the frequency and he obviously had the tractor radio tuned in as well.

"You guys go ahead and finish up here," Kelly continued. "I'm heading out to the dig and I expect to be back about 1800. If you want me, call on 120 kc."

The tank swung ponderously and ground away toward the sharply slanting mountain wall and carbonate beds two miles west.

"What about the U.N.?" Robertson asked after the tank disappeared down the well-beaten track.

"Well, they heard about our mining project somehow. And to use Matt Dillon's own words, they warned that 'anyone who buys anything but one hundred percent terrestrial-made gas, gets his ears shot off in launch taxes next year.' "

Carter looked around then sat down heavily on the sand pile.

"Great! Now what?"

Tupac squatted down facing him, grinning behind his filtered visor. "It would appear that the threat has bothered neither Dillon nor the Americans nor the Soviets. Dillon quoted the U.N. charter back at the Secretary's office and both

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countries supported him. Dillon feels that with both big powers against the U.N. stand on the mining, that they will drop the launch tax threat."

"Any idea of the prices and tonnages?" Robertson asked.

"According to what Dillon told me, both countries will buy all that we can produce at one hundred U.S. dollars per pound of liquid oxygen and one hundred fifty dollars for hydrogen. They pay delivery costs."

"Whoopee and assorted cheers," Carter said wearily. "Work, work and more work. Now we even gotta produce. I suppose he signed a contract for some outlandish poundage by an impossible date?"

"One ton, one lunar cycle, both bases, both gases. It was necessary to keep the U.N. from butting in," he added.

"The way I feel right now, let 'em butt in. Brother, am I bushed."

"How long have you been working out here," Tupac asked casually.

Robertson turned toward him, but the filtered visor made it impossible to see, let alone read any expressions.

"About two hours, why?"

"That's pretty heavy work you two are doing."

"So what," Robertson snapped. "We're perfectly capable of handling our end."

"Wait a minute," Tupac protested. "I wasn't suggesting . . ."

"Look," Robertson interrupted, "we're well aware that you have it all over us when it comes to being able to work hard. We've been doing all right while you were gone, so don't start . . ."

"Hold it, Jim," Carter said sharply. He had sat quietly up to this point and not taken part in the often recurring argument. "Tupac didn't mean anything. And besides, he should be concerned about us. Face it. He is better at this sort of thing than . . ."

Robertson jumped to his feet. "I don't admit anything of the kind. If he thinks he's so great, then he can finish off the whole job by himself." And he turned and stomped off.

"Damn," Carter swore. "Looks like I really said the wrong thing."

"We both did," Tupac answered slowly.

He stood and picked up the shovel Robertson had dropped. "Guess we had better get this finished."

An hour later Tupac and Carter finished covering the dome. They trudged into the pressure tent and stripped off their suits and Carter got busy in the kitchenette preparing dinner.

An uneasy silence that Tupac tried vainly to ignore filtered through the dome, slightly bigger than a medium-sized mess tent. The compressor whirred its ever-present background drone and the flickering of the pressure needle on the indi-

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cator caught his attention. It was flickering into the yellow again. Tupac got up and reached across to the compressor and tapped the dial with a fingernail. The needle wavered freely but returned to its location in the yellow scale. The pressure indicator was a differential pneumatic transducer. A simple bellows arrangement used the outside vacuum as a reference point to measure the internal ambient atmospheric pressure. Tupac had suspected for nearly a week now that some of the powdery soil they had been throwing on the tent had begun to work its way through the seals on the part of the unit exposed to the outside. He flicked the bleed valve to allow a short burst of air to loosen up whatever dust was inside the housing, then held it down for thirty seconds. Immediately, the compressor shut down and the needle began to fall back. Satisfied, he sat back down, making a mental note to overhaul the instrument before it allowed enough air to be pumped in to tear leaks in the fabric. But right now, Robertson's assay reports had built into a large backlog during his absence and he forced himself to the tedious reading task.

When Kelly came in, Robertson was lying on his bunk, face to the wall, reading. Kelly stripped off his suit, hung it up and walked over to the table. "Doggone, that stew smells . . ." Kelly paused in midsentence, suddenly aware of the tension in the room. Most of Kelly's adult life had been spent in close confinement with other men under stress-producing situations. He had seen action in the South Atlantic hunter-killer Navy submarine packs and later off the Korean coast. Then duty in the Midway Space Station before the blowout. Thirty years and he could recognize when nerves were fine drawn and tempers short from the smell of the air and the feel of the atmosphere that men with only thin walls between them and extinction produced. He needed only one glance to tell him that Robertson was the center of the micro-storm.

". . . good," he finished with barely a pause.

He swung his grizzled head to survey the room, Tupac sitting at the table studying a microfilm reader; Carter carefully watching the pressure cooker; Robertson stretched on his bunk, his back and hunched-up shoulders an eloquent display of self-wounded pride contesting with anger.

"Geronimo, you made it back! What's the good word!" He dropped his heavy frame into the chair on the other side of the table, kicked his boots off and sighed deeply. As Tupac repeated what he had told Robertson and Carter earlier, he studied the face of the Amerind for any sign of what the trouble might be, although he already had his suspicions.

"One ton," he repeated when

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Tupac had finished, "that's a mighty tall order for a mining outfit that's yet to lift the first shovel."

"Chow down," Carter announced and slung the covered mess kits across the room. He tossed them easily. Kelly caught two, stretching forward for the second. "Heads up," he yelled and Tupac caught off guard, made a clumsy snatch and missed the third which bounced off the mattress on Robertson's bunk.

Robertson came off the bunk like a wounded buffalo. "What are you trying to do, kill me?" he shouted! As he hit the floor he was off balance and moving too fast in the low gravity. He hit the wall with a sharp crack. Robertson recovered and swung around; his face livid. "That does it! I've had it with . . ." He shut up abruptly and stomped into the storeroom, slamming the hatch behind him.

Carter marched over to the table and planted himself in front of Kelly.

"That does it is right, Kelly. That's the second temper tantrum he's thrown since we've been here. We've got too much at stake to put up with that . . ."

Kelly jammed his hands in the pockets of his levis and leaned back in the chair. "Calm down yourself. Go a little easier on him . . ."

"Like hell I will," Carter exploded. "There're four of us crammed into five hundred square feet. Things are rough enough without having to put up with a kid who takes offense at everything that happens."

Carter put his hands on the table, fingers gripping the edges, to regain some control. In a lower voice, he continued. "Outside when Tupac got back he threw a tantrum and walked off the job because Tupac wanted to know how long we'd been out. That's Tupac's job, to keep tabs on us. We can't take the low pressure work. He can. Either that kid has got to learn some self-control, or I'm heading back."

Kelly regarded him for a moment. "You got it right when you said he's got to learn self-control. But, at the same time, he's a very brilliant selonologist. And we just can't call up the employment agency and have them send a replacement."

"Well," Carter was somewhat subdued, "you're the straw boss of this outfit. You keep him in line."

Kelly chuckled. "You know, Hank, everyone has their cross to bear. You have Robertson. I have you, I guess. And Tupac has this whole screwball outfit."

"I sure have," Tupac grumbled. "Back home, when anybody stepped out of line I had a quiet talk with him. If he got out of hand a second time, I put him in the hospital."

"Tupac," Kelly said as he let the chair drop down on all four legs and got to his feet. "You spent too much time with the Russians, I think." Still grinning he followed Robert-

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son into the storeroom and carefully closed the door.

The following work period passed without incident. While Robertson and Carter dug into problems with the solar oven, Tupac and Kelly headed out to the "dig" to finish the survey. All the way out Kelly was unusually silent and Tupac, catching the other's mood, stared impassively out the ports at the jumbled and desolate landscape.

Except for the black sky and the always present stars, it seemed remarkably similar to the Andes above the vegetation line. And at night on the slopes of Oracona he would have been hard put to tell the difference. No, that was wrong, he considered. Here there was color: blues, greens, tawny browns, razor edged blacks, occasional yellows, and in the sunlight, sometimes all almost fluorescent in brightness.

Kelly pulled the tractor around and the two got out and trudged to the survey site. The instruments were just as they had left them and conceivably they could have been expected to stay that way for a thousand years.

Kelly took the less demanding task of operating the theodolite while Tupac ran the lines. The deposit they were surveying now was three hundred and ten yards long but only sixty wide at its deepest point. They spent the next two hours pinpointing the blast holes at the northern end of the bed. Every nine feet they staked a point, in line with their grid maps.

The bed of ore on which they were working was composed chiefly of Olivine melitite leucitite. Tupac had worked with Robertson for nearly two weeks, pouring over the low-level satellite photo maps until they had spotted the distinctive greenish olivine color near the base of the long extinct volcano range that formed the mountain ridge separating them from the base. Nearby was an extensive bed of pitchstone, and Tupac had collected and run samples through the oven for several days before abandoning that deposit as useless. Terrestrial pitchstone was extremely high in water content, nearly five percent by weight, which meant it would produce one precious gallon of water per cubic foot of rock. About four percent of the water in pitchstone is trapped in the rock in the form of minute drops of water and the other one percent or so as oxygen hydrates or OH. Lunar pitchstone, over the millions of years since its formation had lost much of the trapped water. Olivine melitite leucitite on the other hand, contains about three percent water by weight whether terrestrial or lunar, totally locked into its chemical composition.

By crushing and heating, the water could be driven out as vapor and distilled by cold trapping. The Moon was ideal for this sort of operation, particularly in the lunar

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polar regions where sunlight was continuous during the twenty-seven-day lunar cycle. The absence of a sensible atmosphere made the distillation process simple and the −230°F. temperatures in the deep and continuous shadows provided by the landscape were ready-made cold traps. Electrolysis of the water thus gathered produced both oxygen and hydrogen.

Tupac trudged back and forth until the marker stick was in line with the vertical crosshairs in the theodolite. Kelly gave him the double arm wave and he ground the point into the lunar soil, then with a twenty pound short-sledge, drove the plastic marker. They had been working silently for almost two hours when Kelly called out; "Break for lunch?"

"Amen, brother. And I'm running low on air, too." The warning alarm had been buzzing every thirty seconds for the past several minutes and his gauge indicated slightly less than ten minutes of air left in the tank.

The two stripped off their suits in the pressurized interior of the tractor. Kelly had parked half-in and half-out of a long rock shadow to conserve battery heating power. Natural convection currents set up along the hull between the hot and cold ends of the tractor did much to keep the interior temperature bearable.

The interior was modeled after the long-distance sno-cats developed for Antarctic exploration and contained everything needed to keep four men alive for five days; food in ration form, two hundred gallons of water, and six-thousand pounds of stored compressed air. The tractor also contained their large radio-transmitter by which they could reach any inhabited spot on the Moon via the two relay satellites in lunar polar orbits. Banks of solar cells lined the roof and extended to either side in collapsible panels for emergency use. These furnished power only to run the radio and life-support systems. But banks of rechargeable sodium-sulfur batteries drove the four trac motors and could be recharged in six hours from the solar generators at the main base and the smaller solar generator that furnished the power to the mining camp.

The tractor, obsolete by current standards, had been obtained as part of the lease package from the U.S. base. Tupac's prospecting tractor had been obtained similarly from the Russians. When both tractors were in use as at the mining camp, no vehicles were left at the base and any emergencies would mean that one of the two national bases must be called up to send a hopper for rescue work. All were aware that this was a totally unsafe procedure, but there was no help for it.

Kelly warmed the rations in the oven while Tupac shucked out of

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his heavy suit and started to work checking the placement of the stakes by transposing a plastic overlay—made up while they worked—on the grid map before him. Shortly, Kelly came over to the table with the food.

"What's it look like?"

"Not bad. Overall, there is less than a four percent deviation. If we correct sites 51 and 93, I would say that we are close enough."

Kelly sat down and pulled the map and overlay toward him while Tupac ate. He sat for several minutes, carefully rechecking each site.

"What about forty-three. That's three inches northeast of where it should be."

Tupac chewed silently, studying the map again before answering.

"Yes, I considered that, too. But, if you notice, there's a shallow crevice about three meters deep, less than a meter from the drill site. That should more than make up for the offset. I think the force of the charge will push the crumbling toward the crevice."

"Hm-m-m. You just might be right." Kelly pushed the map away and started eating. "Anyway," he said through a mouthful of food, "you're the expert." Neither said anything for long minutes.

Finally Kelly broke the awkward silence. "Tupac, Robertson doesn't bug you, does he?"

Tupac looked blank.

"I mean," Kelly tried again, "Jim's nonsense yesterday, and his quick temper, that doesn't bother you, does it?"

Tupac stood up from the table and reached for his suit. "No, why should it," he asked flatly. He swung back to the table. "Look here," his voice was level, his red-brown face impassive, "he's young, and he's afraid of his position. He sees me as a threat. As soon as I can convince him otherwise, we'll be able to get along the way we should."

Kelly glanced up without raising his head and crossed his knees. "I talked with Jim last night and his story leads me to pretty much agree with your analysis, except for one point. You are a threat to him. You can work eight hours or longer a day in a pressure suit. He can work three at the outside. He's a geologist fresh out of college. You're a mining engineer with several years of exploratory geological work under your belt. You are a threat to him in every way." Kelly paused to judge the effect on Tupac and he wasn't disappointed. "If you decide to stay with the Republic, you've knocked him out of the front running as chief mining engineer, hands down. So, if you want my advice I'll give it. If not I'll shut up."

Tupac walked back to the table and sat down facing Kelly. "All right, I'd like to hear your advice."

Kelly said flatly: "Have it out with him. Fight him if you have to. He's still young enough to be impressed by physical prowess. He's the kind of guy who'll accept that."

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Tupac looked pained and stared at the table. "I can't," he said quietly. "For one thing, I would probably hurt him badly. I am at least twice as strong as he is here. There would be no contest." Tupac paused a moment: "No, that would not be the answer."

Kelly shrugged. "Well, its your problem. Just don't let it get out of hand."

He glanced at his watch and reached for his pressure suit. "Come on, we can get those last three blast holes re-drilled before quitting time."

Again, that evening, the tension was palpable in the pressure hut. Tupac worked quietly with Robertson on the assay of a new dig he had located farther south toward the Alpine pass. The two men sat together, a study in racial differences; Tupac, of medium height but powerful in build with wide shoulders and blunt fingered hands. Where the Amerind was powerfully built and his skin faded in the sunless environment of the lunar base to its characteristic reddish hue, it still contrasted with the blonder Robertson. Robertson was tall and lean and his whitish skin gave him an air of delicacy unless you looked beyond at the powerful swimmer's build and long, taut muscles. For all his youth, Robertson might match the Amerind in physical strength—but only at sea-level altitudes. On Luna, Robertson was a poor second to Tupac Araptha's vitality and endurance.

As they went over Robertson's notes and the samples together, neither saying an unnecessary word, Tupac was as aware of the conflict as he was of his helplessness to resolve it.

Carter, still unhappy about the previous afternoon's flare-up, had submerged himself in checking out the complex of detonation caps and leads they would use the next morning on the ore bed. Each cap, which would later be inserted in the explosive, had to be timed exactly for the maximum effectiveness. If properly sequenced, the force of the high explosive would crush rock into pieces fine enough for their home-made crusher to finish.

Kelly sat on a bunk, clipboard on his knee filling out the daily report. Actually he had finished the report an hour before. Since then he had been writing out his impressions of the past thirty-six hours in the hope that putting the facts down in black and white would show him the threads that would untangle the mess.

After twenty minutes of straight writing, he laid the pencil down and put his head in his hands, fingers massaging his eyes. When he looked up and around at the room, everything appeared peaceful enough. The three men sat working at their various tasks. The room was now noticeably warmer. The normally low mutter of Tupac's and Robert-

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son's voices boomed fitfully and the only other sound in the room was the scrape and clink of Carter's screwdriver on the wiring junction box and that, unnaturally loud.

Robertson looked up at the same time. "What . . ." and an instant later was on his feet. "Air's out. Everyone into suits," he snapped.

When two inches of plastic sheet and insulation are all that stand between you and total vacuum you move fast. Within seconds, suits were being zipped and helmets sealed.

"Count off," Kelly demanded. The half-finished check-out sequence was interrupted by a semi-soundless explosion that blew out the unbanked south wall.

"Carter's dead."

That was the first sensible thing that filtered through to Kelly from the pain-shot haze. He forced open his eyes and made out a blurred pressure helmet that steadied after a moment. The helmet had Robertson's name stenciled across the brow. He struggled to get up.

"Easy a minute," Robertson said soothingly and pressed him down. "Is anything broken?"

Kelly sank back down against the rock, gasping slightly. Experimentally he moved his arms and legs then groaned with pain as he wriggled his left ankle. "Ahh!" For a moment the star-streaked sky spun, darkened, then cleared as the pain subsided.

"What is it," Robertson demanded, running his gloved hands down Kelly's leg?

Kelly moved the ankle again. This time he was ready for the pain. It was there but not as bad. He tried it again. No bones grated.

"I think my ankle's twisted. It doesn't feel broken." He paused a moment to gather strength and found that he was terribly weak. His body was soaked with sweat and the middle of his chest enclosed a swollen dizziness that competed with his shuddering stomach for attention; he was tired beyond belief and his arms and legs pained with weariness. "Must be getting too old for . . ." he muttered.

"What?" Robertson demanded anxiously.

"Nothing . . . help me get up." Tupac joined them and together they got Kelly to his feet. He shook off their hands, staggered, then caught himself and hobbled over to a rock outcropping, chose the sun-warmed side and sat down and looked around, fighting all the while to remain conscious.

The pressure tent had collapsed as the air blew out and was now half buried in the insulating sand. Here and there it mounded out with trapped air, but as Kelly watched, the mounds shifted and shrank as the air escaped. One of the tractors, the small one, was canted over slightly but appeared undamaged. The large tractor was intact. Carter's body lay near the

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collapsed hut, his helmet misshapen.

"Any ideas on what happened?"

Tupac shrugged as best his pressure suit would allow.

"The only thing we can figure is that the pressure gauge stuck open."

Kelly nodded. His mind was beginning to work properly again as the shock subsided. "The compressor was running before we got into our suits. That might have caused a pressure build-up. If it got high enough, one of the safety valves could have vacumn-welded shut from the pressure . . ." his voice trailed away for a moment.

Robertson, forestalling him, said soberly, "The pressure tent and a lot of the gear is ruined completely. We have two bottle charges apiece left and the air compressor is useless. But the tractors are still in one piece."

Kelly nodded silently, then struggled to his feet to limp toward Carter's body. Tupac and Robertson following. The sun was low on the southern horizon and Earth was completely out of sight, hidden by the sun's glare on their filters. To their backs, the walls of Kane Crater glowed molten white. Carter's pressure suit gleamed in the reflected sunlight, all but the caved-in helmet which rested partly in the shade. The visor was coated with blood on the inside and Kelly did not look closer.

"We found Hank laying at the foot of one of the support shafts. The blowout must have slammed him right against it." Robertson turned and looked away south, unable to say more.

Kelly nodded and stared down at the crumpled suit. Then forced himself to start thinking about their predicament.

"O.K., let's get whatever's worth salvaging into the tractor and head back to the base. We can't do anything here until we get a new pressure hut." His voice was beginning to regain some semblance of its former authority.

Tupac put a hand on his shoulder. "No, Kelly, we can't go back. We'd lose close to five days traveling and setting up a new base when we get back."

Kelly snorted. "We don't have any choice. Carter's dead. He's the only one who could wire those charges properly. The tent is wrecked. You saw yourse'f the whole south wall is blown out. We couldnt' hope to repair that."

"I said we can't go back," Tupac repeated. "I can wire the charges. We can get . . ."

"Shut up you crazy Indian," Robertson yelled suddenly. "Carter's dead. You want to kill the rest of us?" Without thinking, he swung his gloved hand hard and hit Tupac solidly in the midsection. The blow landed on the buckle of the tool belt and drove it in against the Amerind's diaphragm. Tupac doubled over with a gasp and sank to his knees.

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Robertson stepped back shaking, suddenly aware of what he had done. Tupac crouched on his knees, knuckles supporting his upper body, his gasping for air wracking through their earphones.

Kelly suddenly felt old and weak. He hobbled over and tried to help Tupac up, but the Peruvian pushed him away. Robertson horrified, stood as if rooted. Kelly too weak to do more, leaned on the rock and watched each man, the scene a frozen tableau of insanity.

Finally Tupac caught his breath: "You don't understand," he ground out hoarsely. "To get . . . the ore contracts . . . Dillon signed . . . the lease rights over . . . as security."

Robertson swung round on Kelly but saw only the blank implacable visor staring back at him.

Tupac got to his feet and wobbled unsteadily, then started towards the tractor. "If we go back . . . we lose five days, and five days loses . . . the contracts . . . and the lease rights."

"Why didn't you tell us before," Robertson called after him, but Tupac disappeared through the air lock without answering.

Robertson started toward Kelly, hands outstretched as if in supplication. "Kelly, I didn't know . . . I didn't mean to hit him."

Kelly said slowly his voice impassive, letting his words carry the sting, "Boy, someday that temper's going to get you killed." Then he turned his back and walked slowly toward the tractor. After a moment's hesitation, Robertson followed.

When Robertson cycled through the air lock, he found Tupac at the chart table pouring over the maps. Kelly sat on the bunk, his suit off, massaging his ankle. Without a word, Robertson moved to the first-aid chest and came back with a roll of bandage. He ignored Kelly's protests and began wrapping the Ace bandage around the ankle. When he finished, he started to turn away. Kelly caught him by the shoulder and squeezed hard. Then he grinned at the boy and hooked a thumb at the chart table. Neither said a word for a long moment, then finally Robertson nodded and stood up. They both joined Tupac at the table. He had two charts spread out on the tabletop, one a photo map of the route from the Republic base to the ore diggings and the other, a blast diagram of the ore field they had surveyed that day. Several sheets of paper were already covered with figures.

Tupac looked up to see the two faces; Robertson's twisted with something that was not quite self-anger, not quite sorrow, but more self-reproach. Kelly's face drawn and yellowed, still mirroring the shock his system had experienced in the blowout and the severely sprained ankle. A couple of hours sleep would cure that he knew. All

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in all, the three of them had come through in fairly good shape. He tried not to think of Carter's body lying against the remains of the pressure tent.

Without preamble, he said, "It's pretty obvious we can't all go back. Here's what I propose. Kelly, you take the small tractor and the spare oxy-bottles and head back to the base for help. Jim and I will stay here, use the big tractor to live in and get the ore beds blasted. I checked the ovens over. They are all right except for one fresnel lens. That has a hole punched in it, but we have spares. So, we can start processing as soon as the ore is crushed."

Robertson, subdued, only nodded acceptance. Kelly however, objected. "If you think I'm going to head back and leave you two idiots to yourselves, you're both crazy. I'm still in command of this outfit. You are right in that we cannot afford to go back at this point. But we do have a radio and we're going to use it. While I'm doing so, both of you go dig out the charges and the blasting caps Hank was wiring and get them put together."

Tupac grinned, suddenly, his whole face contorting, and reached for his helmet. "You're the boss!"

Kelly's eyes blazed. "And don't forget it. You two start scrapping again and I'll bang your heads together. You, Tupac, for not doing anything to stop it, and you, Jim, for your childishness. Now move!"

As the two tumbled into the air lock, he found that he felt better already. When they got to thinking about what happened, he knew they would both take care to apologize properly. Kelly grinned widely, at least that much was settled.

By the middle of the next work period, Tupac and Robertson had finished wiring and planting the charges. Kelly had contacted Dillon at the main base through the relay satellite and made his report. At first, Dillon had been shocked at Carter's death and what had happened, then angry with an intensity that Kelly had never before encountered. Kelly knew at that point that Dillon had been on the verge of abandoning the mining effort. In the end, he had agreed to continue and had arranged for a U.S. base to ferry a patching crew. At the end of the long conversation, Dillon had asked about the conflict between Tupac and Robertson.

Kelly hesitated a long moment before answering. "I think it may be just about resolved. Jim's big problem was that he thought that Tupac was brought in to be his replacement. I think even Tupac felt this way and it bothered him. Maybe the shock of Hank's death will bring them to their senses."

Dillon snorted. "Kelly, sometimes, in spite of your experience, you are some psychologist. Never mind, I've had something else in mind since Tupac left. I'm sending

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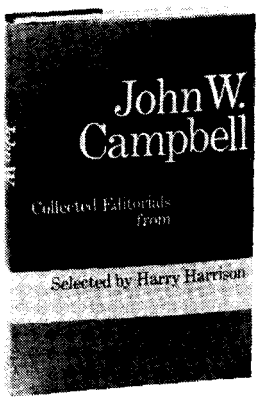

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a replacement down after you blast this bed. As soon as he arrives, put Tupac on the shuttle and get him back here."

"You aren't taking the easy way. . . ."

"No!" he interrupted. "I'm sending Tupac back to Earth . . . to do some recruiting."

"Matt, he'll never buy that."

"Well, he better because it's true. I want him back in the Andes to scare up three or four more recruits. We are going to need more prospectors and miners with his abilities. Those Alto Plano Amerinds are practically made to order for this kind of work. And when he gets back, he's going to run the prospecting show."

"What about Jim?" Kelly asked.

"Officially, I don't know anything about what's happened down there. Your report ended five minutes ago and since then, the recorders have been off. Once Tupac has gone, you announce that Robertson is now Chief Chemist. He's still fresh out of school and has all that 'cookbook' knowledge that Tupac forgot years ago. Maybe he'll grow into the job. Anyway, one thing we have plenty of is job titles. And, it will give him stature with Tupac when he gets back." For a moment there was silence, then . . . "What do you think, Kelly?"

Kelly scratched his head. "I don't know either, Matt. It sounds like it

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might work. Do you really think we need more Indians?"

"Yes." The answer was emphatic. "This mining is going to turn out to be a mighty big venture and personnel is always going to be our biggest problem. The U.S. has promised to freight up five more miners if we can feed and breathe them."

"Well, if we can give Robertson a job in which he can feel he's doing important work, I think it will work. Then it becomes a matter of his seeking his own proper level. You should know that yourself. What makes for dissatisfied elements in any society? No identity, no apparent worthwhile relating to the rest of the real world," Kelly answered his own question.

Dillon's voice was worried as he answered. "I hope we're both right, Kell. Now, the whole deal rests on you. I hope you can make it work. Good luck." And he signed off.

Kelly sat for a long time, going over the events that had transpired, hoping that he had made the right choice in sticking it out rather than in pulling back and trying again. The Republic could probably survive the loss of the lease money if it had to. But, it would set them back dangerously, perhaps permanently. There would be enough of a stink raised over Carter's death when the news got out.

Kelly sighed, got up and climbed back into his pressure suit and carried the scratched piece of aluminum inscribed roughly with Carter's name out to the lonely pumice grave. He stood for a while looking down at the mound of broken rock and dust, then turned and limped slowly down the road towards the "dig." Shortly, he met the two pressure-suited figures trudging back, walking almost side by side. He stopped and relayed Dillon's reaction and they reaffirmed his decision soberly. He did not tell them of the plans for their own personal futures. That would come later when everything was worked out.

"The charges are set and wired," Tupac said. "We can blast anytime."

Kelly raised his head and looked slowly around the sky at the blazing stars. "Plenty of time for that later." Then he looked directly at the two men. "I want you both into that tractor for some sleep before we do anything else." When they started to object, he roared, "That's an order!" The two jumped as the full blast of his voice filled their helmets and grinning sheepishly, they hurried toward the tractor.

Smiling, Kelly watched them go. With men like that, how could they fail. They were all too human, but, they were *men.*

Still smiling, Kelly continued out to the ore field, limping a little. ■

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the reference library

P. Schuyler Miller

APPRAISALS

Science fiction has a good deal more status abroad—in England, at least—than it has in the United States. There it is reviewed and discussed as a serious form of literature; here such discussions are almost entirely limited to the fan magazines. But, slowly, the walls of the ghetto may be crumbling. New York University has published two anthologies of Russian science fiction—though I have yet to see an American university publish a collection of American or English-language SF—Harvard has a new edition of Edward Bellamy's "Looking Backward"—though the long introduction pretty well establishes that Bellamy considered his utopian novel a fantasy—and H.G. Wells is analyzed by an Associate Professor of English at Southern Illinois University because of—and not in spite of—his influence on science fiction.

But the rule still stands. Advent: Publishers have matched the universities with a book on Robert A. Heinlein's work and an expanded new edition of Damon Knight's analytical and critical review of modern SF, "In Search of Wonder."

"The Future as Nightmare: H.G. Wells and the Anti-Utopians" by Mark R. Hillegas (Oxford University Press, N.Y.; 1967; 200 pp.; $5.75) is a study that any Analog reader should enjoy, since the focus is on Wells' early and good science fiction rather than on the rather ineffectual pamphleteering of his late sociological novels. As a parallel, you may want to consider a subscription to one of the best fanzines, *Riverside Quarterly*, published by Leland Sapiro at Box 40, University Station, Regina, Saskatchewan, Canada, in which Jack Williamson's doctoral dissertation on Wells is being published in five installments, and where much of the book on Hein-

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lein previously appeared. (Price: 50 cents a copy, $1.50 a year. Williamson's article began in the August, 1967 issue.)

Professor Hillegas shows us Wells as the product of his times and origins and the disciple of his great teacher, T.H. Huxley, whose "cosmic pessimism" converts most of Wells' earlier stories into anti-utopias or, more generally, stories preaching the fallibility of mankind. There are the books and stories that show Man at the mercy of a ruthless Nature—notably "War of the Worlds"—and stories showing Man destroying himself through a warped society—"The Time Machine," and many others. Only in his late years did Wells apparently decide that his status entitled him to prescribe instead of merely warning, and he swung over to the late and dull utopian recipes of "Men Like Gods" and "A Modern Utopia."

But the part of the book that gives status to science fiction is the last half, in which the author traces the expansion and development of Wells' ideas in other books. Foremost, as they must be, are Orwell's "Nineteen Eighty-Four," Huxley's "Brave New World," Zamyatin's "We," and the C.S. Lewis triology, but Hillegas follows the trail on into the outstanding science fiction of the last twenty years as published here in Astounding/Analog, our better contemporaries, and in England.

"Heinlein in Dimension," by Alexei Panshin (Advent: Publishers, P. O. Box 9228, Chicago, Illinois 60690: 1968; 198 pp.; $6.00) is another in the series of meaty books that this publisher has rescued from the fanzines. As I noted, much of it appeared in *Riverside Quarterly*, with other parts in two other 'zines: Peter Weston's *Speculation* and Benjamin Solon's *Nyarlathotep*. Panshin, himself a sometime SF writer who is serious about his work and who sees no reason why science fiction should not be measured by the same criteria as other literature, goes over Robert Heinlein's work with fine-tooth comb and forceps. What he says may make Heinlein fans fighting mad, for his conclusion amounts to a verdict that Heinlein is merely good when he might have been and should have been great . . . but he says nothing to deprecate Heinlein's great influence on this magazine and on science fiction as a whole.

One of the disappointing things about the new edition of Damon Knight's "In Search of Wonder" (Advent; 1967; 306 pp.; $6.00) is that he hasn't extended his chapter on Heinlein, "One Sane Man," beyond the point where he had to stop when the first edition of the book came out in 1956. Most of the other chapters have been amplified and some new material added—for example, a chapter on unconscious symbolism in science fiction that nobody can possibly read neutrally.

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I haven't been able to compare the two editions, but the publisher says about half the book is new, or revised, or both. Most of it was published when he was reviewing current science fiction regularly and ruthlessly for various SF magazines, calling his shots as he saw them, documenting his criticism meticulously, and applying his own standards to himself as stringently as to anyone else. Knight is the only SF reviewer who ever won a "Hugo" as a critic—in New York, in 1956. (I think it isn't false modesty to say that the award this department got was more of an endurance award.)

Older readers of Analog should appreciate Knight's book more than newcomers, because most of the books he discusses appeared here originally in the "great old days," and because many of them are going to be pretty hard to locate, even in paperback editions, if you don't already have them in your library. There is nothing more frustrating than to try to follow a detailed analysis and criticism of a book you've never read and possibly never will, and the plot synopses, on the whole, merely make the thing sound silly. (This is one reason you seldom get detailed synopses here.)

If you don't buy this kind of book yourself, try to talk your local public library into getting them for the reference shelf on current literature . . . or become a benefactor and take it off your income tax.

ALL FOOLS' DAY

By Edmund Cooper • Berkley Books, N.Y. • No. X-1469 • 176 pp. • 60¢ • Walker & Co., New York • 1966 • 192 pp. • $3.50

This is one of a number of hardback SF books that I missed when they first came out, and that are now available in paperback. The bound volume may still be available in some bookstores.

It should be no news to readers of Analog that the English seem fond of catastrophe stories. John Christopher and James Ballard are perhaps the most vigorous current practitioners of the art, but one must by no means discount John Wyndham. Now old England takes it again—this time in 1971, with a burst of those old faithful "unknown rays" from the Sun. "Normal" people, in England, and presumably all over the world, proceed to commit suicide while the psychopaths, the eccentrics, the artists and other elite inherit the Earth.

Matthew Greville, advertising copywriter and non-"transnormal," probable murderer and ex-convict, rescues a girl from a dog pack on the same bridge where he had, accidentally or not, killed his wife some years before. The book is the story of his life with her and his and others' efforts to hack some kind of sane and stable society out of the mob of ruthless misfits and individualists who prowl the countryside. It's a chilling and fascinating story, and if the producers and

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directors of "black" films didn't insist on displaying their own meaninglessness, one of them might turn the book into a nightmarish epic.

ASIMOV'S MYSTERIES

By Isaac Asimov • Doubleday & Co., Garden City, N.Y. 1968 • 228 228 pp. • $4.50

"The Caves of Steel" and "The Naked Sun" were included in the original gigantic "Rest of the Robots" collection because they were stories about a robot detective, R. Daneel Olivaw. They could just as well have been added to those thirteen examples of SF detectivery, and maybe they will some day.

One of the stories—the fabulous "Paté de Foie Gras," in which biochemist Asimov rationalizes the goose that laid golden eggs—originated here in Astounding. Chemists still chuckle over it, and well they may. Four of the stories of Dr. Wendell Urth, the armchair detective of the future, are also here: "The Singing Bell," "The Talking Stone," "The Dying Night," and the recent and rather inferior "The Key." The first three are classics of their kind. For reasons best known to the Good Doctor, they don't appear together: the stories are printed in order of magazine publication, except for the author's first-published story, "Marooned Off Vesta," which isn't a mystery but appears here as a prelude to its sequel, "Anniversary," which is. "What's In a Name" isn't a science-fiction mystery either, but it *is* a mystery about scientists and science.

You are likely to find the other stories familiar from other collections and anthologies, because they are all good examples of fertile hybridizing. "The Dust of Death" is another with a chemical clue—unfair, I suppose, to nonchemists. "A Loint of Paw" is a short-short exploitation of a time-travel paradox—and who else has considered the legal aspects of the subject? "Obituary" uses time travel again to present a strange suicide that is *really . . . but read it yourself.*

"I'm in Marsport Without Hilda," a not-quite-parody of the hard-boiled-secret-agent-with-too-many-women story opens the tantalizing question of what kind of plots Dr. Asimov might have been able to dream up for "Flint" and the other parodies of the James Bond parodies of James Bond books. Gadgets and outrageous situations that could really work.

"Star Light" was one of—and one of the best of—the series of short-shorts that several SF authors did for a series of advertisements. It's a Greek Fate yarn.

Finally, "The Billiard Ball," in *If* just last year, shows the Asimov typewriter has lost none of its fictionizing flair in spite of having turned out several five-foot shelves of factual tomes in the last few years. It's the beautifully intricate, beautifully simple application of

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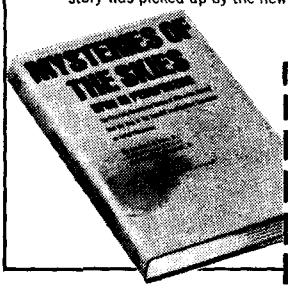

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relativity to murder. More! More! More!

THE BEST SF STORIES FROM NEW WORLDS

Edited by Michael Moorcock • Berkley Books, New York • No. X-1513 • 158 pp. • 60¢

New Worlds, the English magazine of speculative fiction, has earned the same kind of reputation for developing new writers and new styles that Astounding gained more than twenty years ago. First with John Carnell as editor/publisher, now under the guidance of Michael Moorcock, the magazine has been publishing some of the world's finest "straight" science fiction and, more recently, broadening and deepening the definition of "SF" to include some excellent fantasy (including the editor's own) and many stories that simply would not be publishable under the old house rules.

The seven stories in this anthology cover the full SF range, from J. G. Ballard's indescribable "The Assassination Weapon" to David I. Masson's classic tale of a seventeenth century man strayed via time machine into England of our time, "A Two-Timer." The Ballard piece is presented as a series of glimpses into the mental world of a psychotic, which reveal scenes and events that seem to relate to many of his other stories, including a still-unpublished novel. Masson's story is told in the language of a pretty well educated man of 1683 who hijacks an experimental time machine and rides it back to 1964.

Brian W. Aldiss, who crossed into the new country before Ballard, has a very slight bit in "The Small Betraying Detail"—the detail that proves the narrator has somehow been switched into an alternative universe. It's pleasant, but no winner. Roger Zelazny, in "The Keys to December," considers a problem in values and ethics of the distant future, when adapted men who are reshaping a planet to their specifications discover that natives are adapting even faster.

John Brunner is coming to have as much range and variety in his story-telling as his fellow-countryman and king of British mystery writers, John Cressey, but he uses his own name for all varieties. "Nobody Axed You" is a black satire on the entertainment world which grows bloodier and bloodier as the nights pass. Langdon Jones, himself a musician and composer, falls somewhere between Ballard and Bradbury in his story of musicians on Mars, "The Music Makers." Finally, another American, Thomas M. Disch, in "The Squirrel Cage," has a bit of mental kaleidoscopy almost as disturbing as Ballard's.

If you like only the Analog type of science fiction, you probably won't care for this selection from *New Worlds*. If you buy the shift in the meaning of "S.F." to "speculative fiction," by all means read it.

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THE HORN OF TIME

By Poul Anderson • Signet Books, New York • No. P-3349 • 144 pp. • 60¢

The individual who wrote the cover blurb for this paperback apparently dipped into it once and thought he was reading a novel. In actuality it is a collection of six short stories and novelettes, unconnected in any way, including one of the author's best—"The Man Who Came Early"—which demonstrates so beautifully that a functional technology must be keyed to ecology. This story of the doomed G.I. who was transported to Iceland of a thousand years ago is one of the key stories of recent years.

"The Horn of Time the Hunter," which opens the book, evokes a strange world hauntingly. "A Man to My Wounding" is a convincing picture of a future in which we have found an artificial substitute for war in ritualized assassination. "The High Ones" is a pitiless portrayal of the ultimate in the collective state, and "Marius"—published here in Astounding in 1957—is a short, relentless look at the consequences of another kind of government by elite.

The book ends with "Progress," the most conventional story of the lot: solid, satisfying, beautifully worked out—in short, a typical Anderson story. This takes us to a world long after the next nuclear war in which regional societies have rebuilt themselves and are fraying each other's edges. A Polynesian spy ship lets itself be taken to the Brahmin outpost where something strange is going on.

Poul Anderson, as these stories demonstrate rather well, does for human relationships in strange societies what Robert Heinlein does for their technologies. Long may he go on doing it.

SAM MOSKOWITZ
Science Fiction by Gaslight
A History and Anthology of Science Fiction in the Popular Magazines, 1891 to 1911
Illustrated $6.95
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CHOCKY

By John Wyndham • Ballantine Books, New York • No. U-6119 • 221 pp. • 75¢

The invisible—and ordinarily imaginary—playmate is a stereotype of child psychology, and allegedly of child-rearing. It has been

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used before in science fiction and fantasy, usually with all stops pulled out and the amplifier turned up to full gain. This time the development is quiet, persuasive, and to a veteran science-fiction reader, somewhat obvious . . . but it doesn't matter.

"Chocky," we learn—long before the narrator does—is an extraterrestrial, a kind of galactic Peace Corps field worker sent to nudge mankind along toward universal fellowship. He/she/it makes contact telepathically through twelve-year-old Matthew Gore—the blurb writer calls him "Mark"—who matter-of-factly tries to answer the alien's impatient questions about his world, and to get answers when he doesn't know them. The repercussions with teachers, schoolmates, his parents, a jealous little sister, and eventually a prominent psychiatrist, develop about as might be expected, except that the psychiatrist injects a brief and unnecessary touch of melodrama near the end. (For the benefit of film producers, perhaps.)

Readers who aren't told this is science fiction may enjoy it more than veterans who will anticipate the gentle oscillation of the minimal plot. Me, I liked it.

THE LONG RESULT

By John Brunner • Ballantine Books, New York • No. U-2329 • 190 pp. • 50¢

The English edition of this original novel had a warm critical reception when it came out there in 1965. Now we have it, and although Brunner has been writing better and more ambitious books lately, it's still good reading. It also demonstrates what I hope Analog readers have managed to get into their thick technologically tanned crania . . . that a good writer can make a good story out of the most familiar plot and situation.

In this, mankind has been spreading out from Earth into the galaxy. A few colonial worlds have started to take their individual courses away from the home planet . . . and now comes the problem of relations with another, totally alien race.

The hero is Roald Vincent, a not-too-minor official in the Bureau of Cultural Relations. He is drafted to serve as official greeter for a delegation of aliens, arriving unexpectedly in a colonial ship. On one side he is assailed by the radical activists of the Stars Are For Men League; on the other he has to cope with the maneuverings and scalp-taking of Starhome, the colonial planet that made the first contact with the people" of Tau Ceti. He is engulfed in internal politics, involved in a hot love affair that is not running smoothly, and has a variety of other distractions to take his mind off his work. To a degree it's a mystery, to a degree a sociological novel, to a degree a run-hard-to-stay-in-one-place yarn. Brunner, needless to say, keeps all his eggs in the air expertly.

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brass tacks

Dear Mr. Campbell,

I, too, am a non-subscribing reader and I wish to sharpshoot Norman Phelps' letter in Brass Tacks.

To begin with, the lack of interchangeability of parts of the Ferguson—actually Warsop—rifle had nothing to do with the annihilation of the Tory Rangers at Kings Mountain. By an unfortunate and unforeseen trick of chance Major Ferguson's raid coincided with the return of the "over-mountain men" from the frontier. The Tory Rangers, well-trained in bush warfare, well-disciplined and well-armed were the equal, or superior, of most American irregular or para-military bodies of the time. Under the particular circumstances of King's Mountain they could probably have defeated any American force but the "over-mountain men." They had the hard luck to run into this bunch and in so doing found that the "over-mountain men" were closer to their natural tactical element than the British troops. Result —total destruction.

Today it is a common fallacy to point out the imbecility of the military mind in retaining the smoothbore for so long a period after the rifle had been invented. Regardless of the fact that the military had as great a share of pedantic idiots as does major industry today, and irrespective of the fact that the rifle was an expensive weapon—not adapted to mass-production—there were other sound tactical reasons that favored the smoothbore.

For example, the Kentucky type rifle used a patched ball and varied powder charges, necessitating loading from a powder horn with separate ball and greased patch, which took a long time. The military smoothbore could be loaded quickly and easily with a cartridge which was formed of paper around the ball and carried both priming and propellant charges. The soldier merely cocked, primed and poured the remaining powder down the

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barrel, then rammed the paper and ball down the barrel together. This gave the smoothbore a high rate of fire, perhaps five times that of the rifle. It was not until the invention of the minnie ball, enabling rifled musket one piece cartridges, that the rifle became more practical than the smoothbore for military purposes.

The smoothbore was usually a very large bore, so it must be thought of as a shotgun. The U. S. Army standard load, until the adoption of the rifle, was three buckshot and one ball—although charges of nine or twelve buckshot were also alternatively provided. The British are on record as having instructions to load with two balls during the short and decisive action at the Plains of Abraham in 1757. Therefore, the smoothbore was far more deadly at short ranges than the rifle due to its vast number of missiles per shot and its quickness to load.

The effectiveness of the American rifle during the War of Independence has been distorted. Both the British fear of and the American confidence in American riflemen underwent great modifications as the war progressed. The rifle became a respected, but not greatly feared, arm.

The British Light Infantry—in spite of the distortions of the average high school history book—was perfectly capable of dealing with American riflemen as they proved quite often.

Flexibility, fire and movement, discipline and quite often ruggedness of terrain combined to either overcome the effectiveness of the rifle or to, in the latter case, limit its effectiveness to the point of favoring the smoothbore (shotgun).

In support of this shocking bit of information we point out that it eventually became a tactical doctrine, laid down by George Washington, that riflemen, unsupported, would *not* be used for security duties in static positions unless supported by line battalions armed with smoothbores and bayonets.

This indicates that our hypothetical Connecticut Yankee would have to know about as much tactics and history as he would mechanics. Along this line we note that the British Line at the conclusion of the Seven Years War in America was highly flexible in bushwarfare. The provision to remain so was in their manuals, yet in the period preceding the wars military pedantry had so glossed over this that most of it would have to be re-learned.

Actually our Connecticut Yankee would have an insurmountable objective to attain in breaking the innate conservatism of the leaders rather than introducing an invention. A Genghis Khan, Julius Caesar, Alexander the Great, Nathan Bedford Forest, or Duke of Wellington occurs rarely. All human history shows less than a dozen military leaders possessing the plain gumption to grasp quickly the im-

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plications of a new concept—and Napoleon Bonaparte, in particular, is not one of these select few.

To further this thought we would point out that Mr. Phelps' remarks about technology allowing the profusion of Napoleonic artillery to be produced for Marlborough were mistakes in concept. It was not a problem of technological development that limited Marlborough's artillery but rather one of tactical employment. The sheer imbecility of the leaders caused them to ignore the use of Gustavus Adolphus' artillery eighty years earlier. Marlborough's guns were properly designed for the tactical doctrine for which they were intended. Gustavus Adolphus' guns differed from Napoleon's mainly in being of smaller bore and using smaller powder grains, thereby limiting muzzle velocity to a minor degree. In technique of fire they even were *superior* to Napoleon's guns in some minor respects. And who can say that Torstenson's tactical concepts of fire and movement were not truly Napoleonic?

How then would our Connecticut Yankee fare if he were to tell a pedantic old field marshal that his tactics were wrong when said field marshal had spent the last thirty years involved in palace revolutions over the color of facings and arrangement of buttons of the household brigade while acquiring a smattering of gunnery and mild exposure to flank security during odd moments? No one can tell anything to an expert—particularly an expert who is totally incompetent at that which he is supposed to be an expert.

So, it is not so much the introduction of new inventions which influences war but rather it is a sensible employment of those available that makes this concept decisive.

Personally, as a Connecticut Yankee, I can offer only one invention to an Eighteenth Century gunner. To wit: a firmed mortar shell with a contact detonator operating on the flint and steel friction principle—both consistent with the technology and highly useful against concentrations on reverse slopes.

A bubble type gunner's quadrant would have been an improvement and a wider use of the quadrant in long-range fire would have been useful, but there is some doubt that the technology of the day could have mass-produced good ones—for a decent expense—if at all, at any rate enough to justify the use of it.

Possibly the introduction of the split-trail in order to give a wider range of elevation without re-laying the piece and mainly a stable means of maintaining effective, accurate deflections, also producing a gun-howitzer combination would have been good. However, it is doubtful if the gun carriage could have been made strong enough to do this and remain within weight limitations until someone invented

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a suitable recoil mechanism. This would depend upon the then unknown science of hydraulics.

To conclude our remarks about our totally unnecessary Connecticut Yankee, we have as recent as 1915 an example. The introduction of the machine-gun interrupter or synchronizing gear by Anthony Fokker—who took the credit for, but did not invent it—resulted in a six-months panic and many wild pusher designs in order to match the front firing capabilities of the very inferior Fokker monoplane.

Yet the Allies had in their possession a weapon that was far superior at the time to the unimpressive Fokker monoplane. Namely, a Lewis gun mounted on the top plane of a Bristol biplane, the hottest airplane of the times. The Royal Naval Air Service used this to some minor degree *prior* to the "Fokker scourge." Since the RNAS at the time had only minor brushes with the enemy, we can only assume that no one in officialdom paid the slightest attention to a gun firing *outside* the propeller arc on a tractor type. It was easier to show how smart they were be designing inefficient aircraft with the propeller *behind.* (Perhaps Bristol Ltd. did not have a good public relations staff and Vickers Ltd. *did.* Vickers *could* very well have had a real dog of a pusher on the drawing board and wondered who was going to buy it, thus finding that Fokker's new gadget was a godsend provided they could keep Bristol's capabilities a secret.)

The simplest thing a hypothetical Connecticut Yankee could do would be to give stirrups to the Roman Cavalry to enable them to utilize shock action in a charge. This would probably not affect history, however, as other influences would assure dominance of the battlefield by the infantry.

So much for our Connecticut Yankee.

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Dear Mr. Campbell:

I've been a reader of Analog ever since a young teener, but I've never felt the urge to write to you before this. I've always enjoyed your editorials, especially those attacking the monolithic structures—to borrow a term from the libs—in our society, e. g., Big Business, Big Labor, Big Science and Big Government.

And Big Education. Here in California—I can't speak for other areas—we have been saddled with a whole generation of nonreaders, nonthinkers, and nonworkers. With the most fantastic welfare program of any of the stages, we have a lot of the last mentioned, even unto the second and third generation, so far. Justifiably, it is occasionally theorized that the root of our domestic

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problems—most of them, anyway—lies with the school system, where the only things currently taught are: the pursuit of mediocrity, free love, and dependence on Big Brother. Excellence is frowned upon, indolence is not criticized, and failure is not recognized as existing.

It is almost as if the society here has been engaging in an era of Orwell's "double-think": War is Peace, Love is Hate, Ignorance is Truth. In our case, Bankruptcy is Prosperity, Failure is Success, and Compulsion is Freedom. Add to this the flagrant decay of morals, the widespread use of drugs, the weakening of family structure, the subversion on our campuses and the numerous teenyboppers and hippies populating our cities and congested suburbs, and you have a beautiful picture to send home to your relatives in the cornbelt.

Groovy! As if the cornbelt didn't have problems of its own.

While it is easy to pinpoint symptoms, it is not so easy pinpointing remedy. Perhaps remedy is not available, or, as expressed by leading exponents of our TV talk shows, remedy is not necessary, since nothing is really wrong. Society is just in a state of flux (admitting readily—when is it ever not?), and the status quo middle class citizen is just unwilling to accept, and is frightened by the natural evolution and cultural liberation that is now taking place. Then something is mumbled about the Information Explosion and the Population Explosion, and that the current crop of adolescents is the brightest, the best informed, the most gifted that it has ever been privileged the world to witness. Bravo for our youth!

Not far enough away am I from that category that I fail to feel nauseated. Hippies have a point: resigning from a society that makes demands on them they are not ready to accept. Of course, they don't see it as that; but that is what it is. They blame society and not themselves. Unfortunately, they are hitting the nail on the head, but they are not succeeding to hammer the point home. Having a love affair with Mary Jane, or driving down Route LSD with high speed is not the way to go about it. Nor are long hair and tight pants and loose morals the best way to impress Daddy that he has given you a bum steer, if any. But, then, what is?

"Love" is the motto of the Flower Children. That these hapless products of our unloving culture should mouth such a hideous distortion of the most beautiful of human emotions comes as no great surprise. Nor should it. But, then, no remedy is really needed, now, is it?

Stalin wanted only one generation of our children. I am not saying that the Communist Conspiracy is behind our present cultural devolution, nor do I say they are behind the perverted educational principles that are being practiced today; but what better way for any conspiracy,

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left, right or middle, to prepare for a general takeover? Once a people are demoralized and confused, they begin grasping at various political straws in a vain effort to keep from drowning. Under such circumstances, it is not difficult for a leader with an efficient minority behind him to put himself in power, as did Hitler in pre-war Germany. Nor is it difficult for a determined leader to put himself in dictatorial control of a republic of confused, apathetic citizens, if he has the emergency powers now granted the President of the United States!

Of course, it cannot happen *here.*

C. EUGENE COX
1514-C N. Harper Street
Santa Ana, California 97203

Stalin wanted one generation of our children? Wonder how he'd make out if all those hippies were dumped on him?

Dear Mr. Campbell:

It is doubtful that the Dean Drive is the true or ideal space drive. It's too complicated and frustrating to build—but lot's of fun.

Get a copy of U. S. Patent #3,187,206 entitled "Electrokinetic Apparatus," 1965 by inventor Thomas Townsend Brown. The story of this gadget would make interesting reading. It is about as close as you can get to a Solid-State Space Drive. No moving parts to wear out, simple to produce and cheap.

How does it work? It is essentially a shaped capacitor. Consider a simple parallel plate capacitor. If the plates are of equal areas and the dielectric is of uniform cross-sectional area, no thrust is obtained when the system is subject to very high voltages. BUT, if you change the surface area of one and pound it into the shape of a paraboloid, for example, and make the other electrode a sphere and placed at the focal point of the other, larger shaped electrode, well then thrust is obtained in the direction of the electrode of larger surface area when high voltage is applied. Generally, thrust is in the direction of the lower flux gradient. Efficency is proportional to the degree of distortion of the normal electrical field lines, which may be further enhanced by using insulators of varing dielectric constants and varing cross-sectional areas.

Build a full-wave voltage quadrupler using a neon transformer, and experiment around with this concept in your basement lab and observe the effects of 60,000 Volts DC on modified capacitors.

Brown performed experiments in vacuum chambers and found that the gadgets tended to push themselves away from the walls of the chamber—sort of a gravitational repulsor. The article entitled "Flight Without Stress or Strain" in the June or May issue of *Interavia,* 1956 first gave information about Brown's work. Major Serversky's Ioncraft works on charged air molecules, but also employs the above mentioned

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principles and makes reference to Brown's patents in his own work.

Some metals are better than others in achieving the effect, and they are called gravitopic (or is it gravic?) isotopes. Charles F. Brush and Dr. Nipher at the beginning portion of this century were on the right track, and if they had only persevered in their work, we would have had antigravity a long time ago. Some say we already do, but Uncle Sam ain't talking.

Have you heard anything more about this research?

JAMES E. COX

Sounds like a corona—discharge effect. No good in a REAL vacuum!

Dear Mr. Campbell:

Comments on comments, March issue:

1. I worked for several years with an engineering organization, some of whose members used divining rods for anything they wanted to locate—water seams, gas pipes, water pipes. Not everybody can do it. Not everybody can discover Einstein's Relativity, either. Engineers and Marines are not interested in whether something *can* work or not; they are interested in *whether* it works. How and why come later.

2. Couple Seward's anoxia with Nuttall's acid, and you have the answer to why I helped bury a young friend last year. Anoxia, and euphoria, hyperventilation and the "rapture of the depths" which has killed so many skin divers, alcohol and discoordination, alcohol and delusions of grandeur, alcohol and D.T.'s, LSD and "bad trips"—all the same deal; brain damage. When an acidhead walks out of a window and tries to fly, it isn't sanity that descends.

3. Bate's plaint: Any baby can absorb a bullet, and any moron can fire one with a little training. Neither of them is a discerning voter. If you are going to carry his argument to a logical conclusion, you'll have to let the horses vote on where to haul the wagon. After all, they do the work, don't they? He's supporting the right answer with the wrong argument. The age should be lowered because the kids are getting smarter. You could lower it to ten now and get no worse foul up than we have. Even the hippies get smarter after a couple of washes.

However, some of us relics still do have dried relics of brain—even at seventy-six—rattling around in the skull.

VICTOR ENDERSBY

P.O. Box 427
Napa, California

The problem of voting doesn't depend on "smartness," or intelligence, but on a different thing altogether—wisdom, or judgment. An immensely brilliant ten-year-old may have soaked up huge quantities of data, and still not have the understanding that makes judgment. For instance, no matter how much he's read, can he understand a father's feeling toward his son?

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IN MEMORIAM

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All in all, the Black extremists are no real menace to the Ku Klux Klan way of life—the most effect that approach could have would be to convert about fifty percent of the population into reluctant, but coldly determined, Ku Klux Klaners until the damnable nonsense was suppressed.

The Black extremists, in other words, have the power to make the Grand Dragon's ideal way of life come true—Black Extremism could scourge about fifty percent of the whites into joining forces with an organization that disgusts them.

So no Klansman is really excited about shooting down the H. Rap Brown types—they *help* his viewpoint, by the very viciousness of their hate-mongering. After all, nothing helps a hate-monger like an active hate-monger on the other side. How would the Nazis have gotten started if they hadn't had the Communists to excoriate? What would Communists do if they didn't have Capitalists and Fascists to damn?

The actual score for the Black Extremism is, in fact not merely zero—it's negative. The only changes they've produced have been in such a sense as to aid Klan recruitment, and to harden anti-Negro attitudes.

What can you expect, for Pete's sake? Tell a man "I hate you, Whitey, and I'm going to kill you!" and then expect him to welcome you as a brother in his home, his community—to respond with trust and generosity?

Why hell, no! There's no reason for a white crackpot to shoot a guy like that. *He* isn't doing any real harm. Just a noisy nuisance that doesn't disturb the Klansman's way of life.

It's the nonviolent pressure that has produced real, massive changes. It's the pressure of social law, law-changes won by positive. but nonviolent pressures.

These *have* produced real social change—they *have* produced the changed way of life that the rigid-minded can't endure. (The claustrophobe can ride a streetcar in the open air—but when that car ducks underground through the dark tunnel beneath the river . . . the claustrophobe goes into utter, uncontrollable hysteria of terror. His intellect has nothing to do with it; he is temporarily insane—and, worse, knows he is!)

It's the leaders and organizers who have maintained and constrained the Negro groups to produce those quiet, steady pressures that have disrupted his way of life —and it will, inevitably, be the *effective* changers, not the noisy shouters, that are his intolerable enemies.

In murdering Martin Luther

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King, the white crackpot was giving King the highest possible accolade. He was certifying—with his own life, for he must have expected to die for his crime—that King and his method of nonviolent, slow, steady pressure *was doing what King sought to do.*

King and his nonviolent approach *did* bring about real change. Change that will be a lasting improvement—unless the violent Black Extremists touch off a rebellion that has to be suppressed bloodily.

It is, was, and always will be true that complete freedom of speech is granted to any man, on any subject . . . provided it has no effect. Get up in any American city's park, and spout off the most filthily obscene pornography you want, and no one will interfere with you at all—provided you speak in Old Low Martian, Kalonian or Meskalinese. Any language you like—so long as it conveys no meaning, and produces no effect. You wouldn't be interfered with, in all probability, if you spoke in Tibetan, Tasmanian, or Hotentot, either. Somebody might understand you; there are a few scholars, and a few people in American cities, who might understand those languages—but not enough to bother anyone.

It's when your speech and your actions have real effect that somebody starts wanting to kill you.

Now the essential problem of the Negro-white tension is, simply, that nothing is more difficult than true patience. As something of a rebel and cultural-pattern changer myself, I know a little about the problem.

When I went to school, I started writing science fiction as a Freshman, because I wanted a car—a nice, new Model A Ford. They were expensive, of course—nearly five hundred dollars. In 1931, my friends, that was a lot of money. My father's very reasonable (though annoying!) attitude was, "I owe you a good education; luxuries you get for yourself." My stories sold and earned me the car. (At one half cent per word rates, standard in science fiction then, if you could pry it loose from the publisher, it took quite a bit of wordage.)

My professors did not approve. I was told I was "prostituting my science" in writing that "science-fantasy nonsense—the clearly impossible stuff about interplanetary rocket ships and atomic-power engines."

I've been in that officially demeaned business now for thirty-eight years—editing this magazine for nearly thirty-one years—longer than the average Analog reader has been alive. And I can say this: it takes roughly twenty years for changes of cultural attitude to percolate through.

Science fiction played an important part in producing atomic power plants and rocket ships; by exposing young, still-open and uncom-

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mitted minds to the possibilities and implications, it invited attention to those areas—and, as those young minds matured, acquired status and authority, led to more and more effective research thinking and study in those directions.

Then—in the early '30s—the aliens were indeed Bug Eyed Monsters; friendly, cooperative, peaceful aliens were exceedingly rare. Today, of course, the pattern's been changed—but it took time, and a slow shift of orientation.

Those shifts of orientation, even in fiction, can not be caused overnight. It takes about two-thirds of a generation to do it. And during that time, a slow, steady, nonviolent pressure has to be maintained, so that gradually, there's a shift.

Cultural patterns are written in tar; with warmth, and a slow, steady pressure, the patterns will ooze to new configurations. Strike with a heavy mallet, hammer hard to change them quick—and they shatter.

But perhaps, rather than saying they are written in tar, we should say they are written in plastic explosive. Press slowly and steadily, and it molds anyway you wish; shock it, however, and it immediately ends your desire to change it —and you.

The essence of Martin Luther King's wisdom was in recognition that human cultural patterns cannot be changed suddenly. You *can not* change your basic orientation in a week—except under conditions of such violent and destructive shock as to be totally unacceptable.

Psychiatrists keep trying to find nice, fast ways of changing individual minds; for a while electric shock seemed a wonderful tool. In a matter of seconds the shock can so scramble a mind that for days or weeks thereafter the individual couldn't really distinguish between up and Tuesday. The old, rigid, neurotic-psychotic pattern was gone!

And as the shocked brain healed itself, and regained the ability to integrate patterns . . . there was the original set of patterns.

No swift change of basic patterns of belief achieved.

Naturally, the Negro wants end results today, and preferably yesterday. That impatience is as old as Man . . . or children.

It is, unfortunately, simply not possible. It *can not* be done.

If you have any stubborn delusions that it can, try deciding to change one of your own minor neuroses—and don't kid yourself you have none!—between now and next week.

Martin Luther King was a wise, patient, and effective leader.

That is, of course, why he was killed.

H. Rap Brown and Stokely Carmichael are in no danger; they are impatient, unwise, and ineffective.

The Editor.

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Edited by Anthony Boucher

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